THE AMERICAN

School Board Journal

A PERIODICAL OF SCHOOL ADMINISTRATION

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In This Issue:

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★ **Functional Planning: Bexley Designs a Modern Elementary School Building** — *Fawcett*

★ **What Are Your School Bonds Worth?** — *Mulford*

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★ **Master Lists and Storage of Equipment Used in High School Courses in Science** — *Greene*

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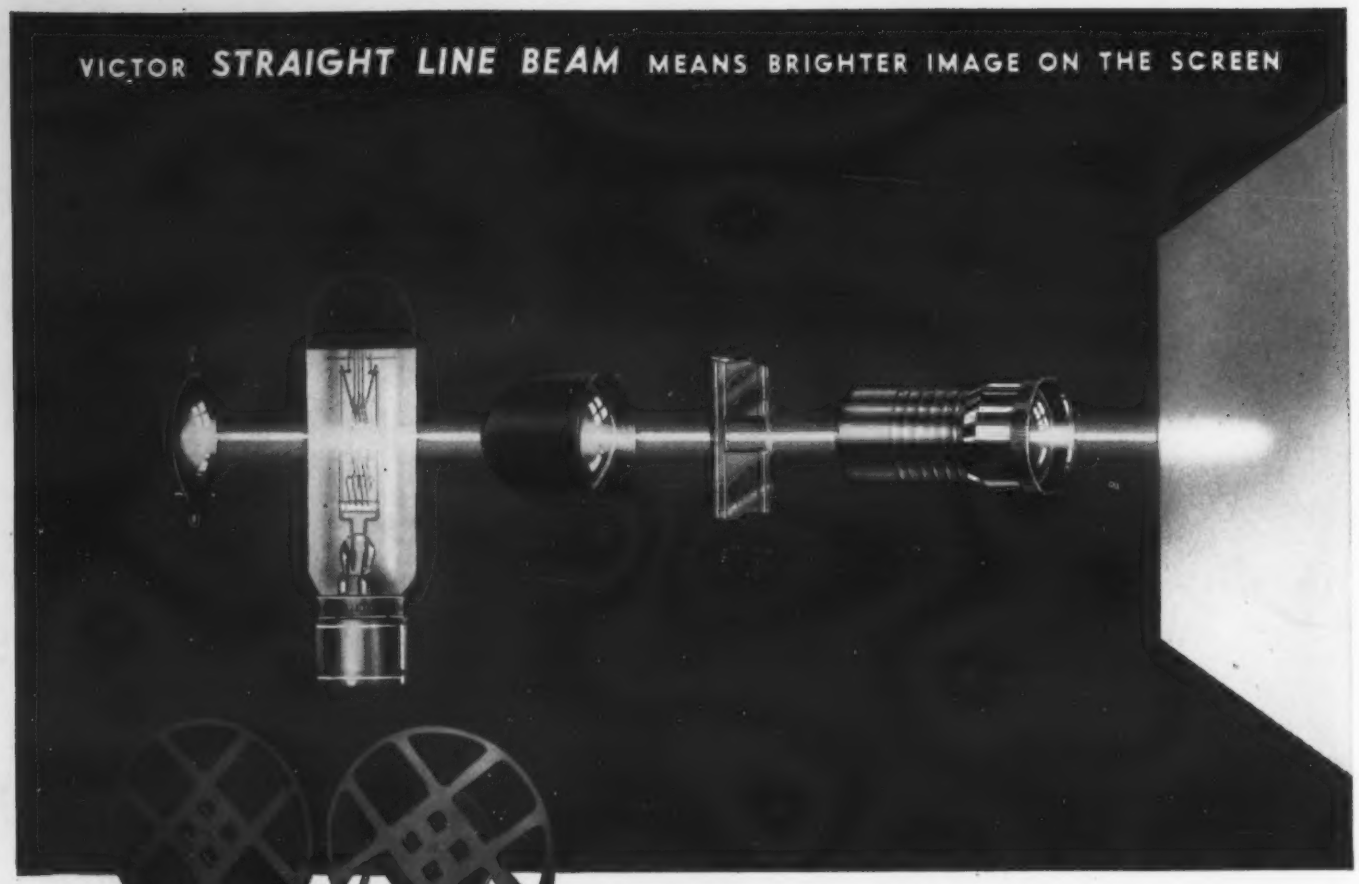

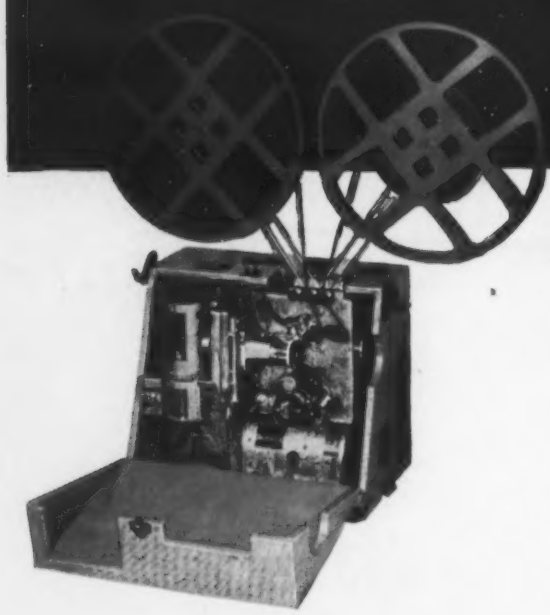

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The Superintendent's Responsibility

Much needed and right now — more factual information on the requirements of the educational program for use in the design and construction of new school buildings and the modernization of existing obsolete schoolhousing facilities.

Detailing the essential educational requirements is the administrator's responsibility. The educational objectives, clearly defined and factually presented in terms of community needs and financial resources, offer the most effective way of directing the schoolhousing program and those matters which properly belong to school boards and school architects.

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The ANNUAL BUILDING NUMBER, featuring professional material and especially prepared articles on the school building program, presents comprehensive schoolhousing information and practical school planning check lists. The advertising pages complement these editorial articles offering valuable product information and services. Refer to this advertising and then make use of the inquiry form on page 87 for product information and services.

JOHN J. KRILL

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The contents of this issue are listed in the "Education Index."

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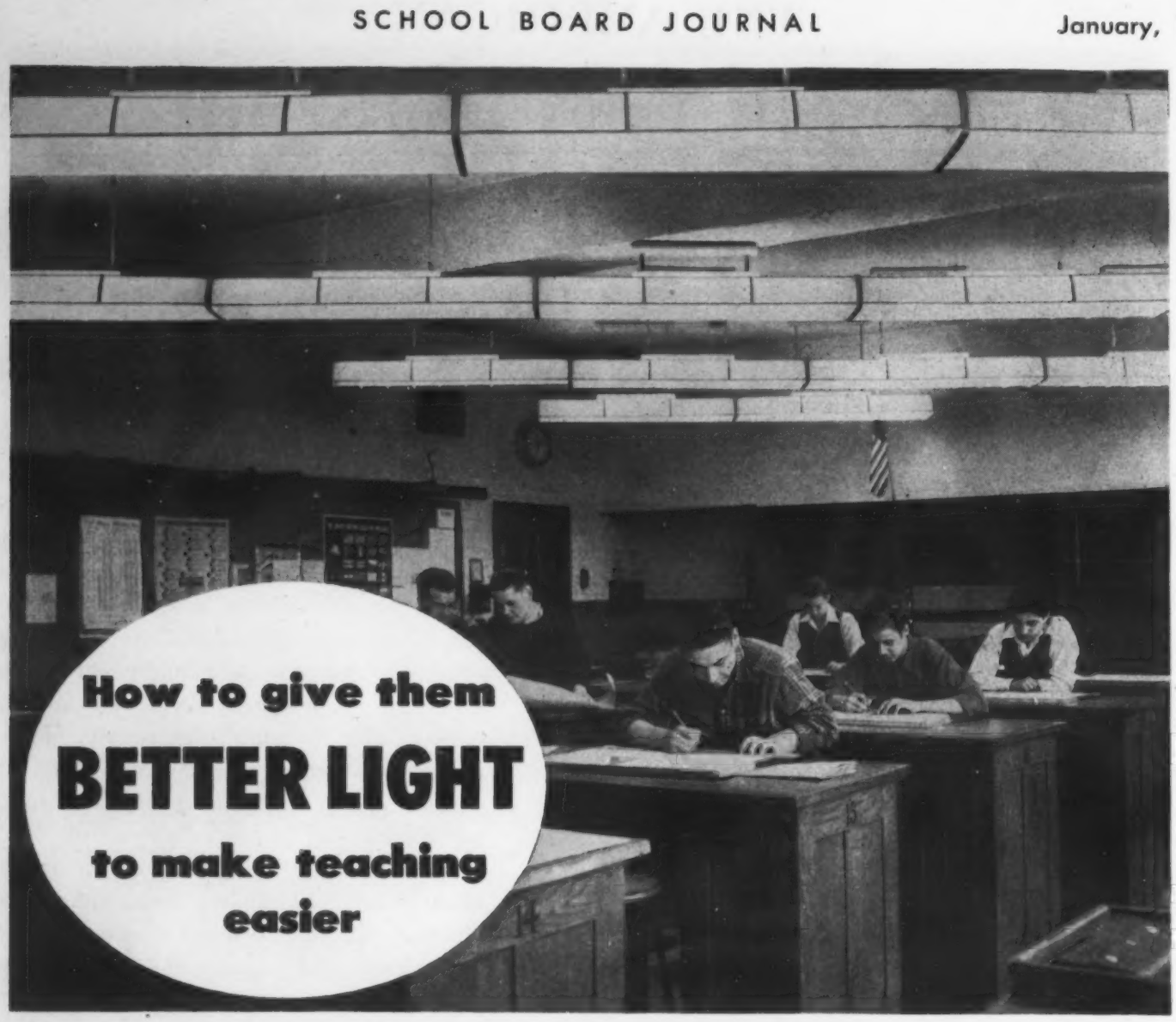

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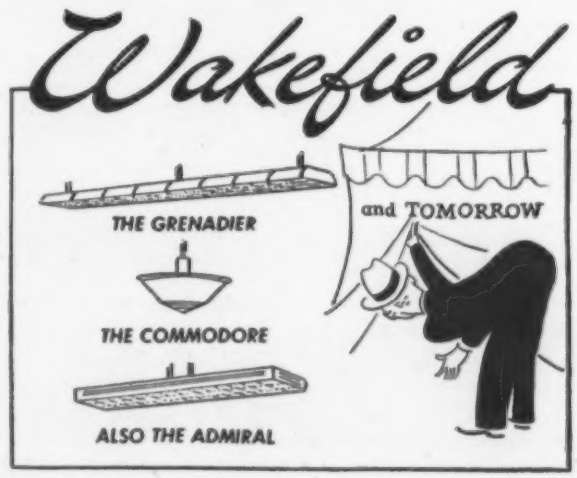


THE AMERICAN
School Board Journal

Volume 112, No. 1 JANUARY, 1946 Subscription, $3.00 the Year

A Study of Postwar School-Building Programs and Planning

H. W. Schmidt[1]

As most readers of this magazine are aware, the editors are interested in the field of school-building planning and construction as evidenced by the pages and articles in each issue devoted to this field. Though such material gives a very good idea, in most cases, what a modern school contains, its arrangement, effectiveness to serve an educational program, and its general construction so, "that he who reads may run," or otherwise; yet as a rule it gives no clue to any future building program including entirely new schools, remodeling of and additions to existing structures, internal improvements and the like; nor does it show trends, modern we hope, of postwar construction in general and in specific details. Both, extent and trends, seem quite important to most school administrators and those interested in the construction and manufacturing field. The postwar reconstruction is upon us and yet many responsible for it are working, if not in the dark, at least in an economic shadow — the way is not clearly defined as yet and it seems wise to determine, if at all possible, where we are going in our special field and along what road, and how the needs which are already arising, can best be met.

We have heard a good deal of an umptieth billion dollar program necessary to keep up with the demand to rehabilitate our school plants which, "have gone to the dogs during the past five years," or "are falling apart" and "are simply wrecks," et cetera, and which call for much needed expansion and new construction. It is suspected that the above quotes are somewhat exaggerated and may be heavily discounted by the reader, as they are by the writer who has seen plenty of schools which are supposed to fall into this category but which certainly do not exhibit such horrific appearance or show any "senile decay." However, how much *is* in the picture; how much is *needed* for rehabilitation, for improvements, for expansion, for new schools? How much is fathered by the wish and a desire to fall into line? What *are* the trends aside from stone and brick and mortar (which are still with us)? What about the "innards" of the new school in the postwar age and it will be and is to be conceded an "age" without doubt.

What Will the Postwar School Be Like?

Are we going to use invisible paint and charged with volatile vitamins, facetiously mentioned, so that no further painting will be required; and will we absorb our daily capsules of vitamins through the schoolroom air? Are we going to use the electronic cell to automatically open the doors to our temples of learning; are we going to do away with windows and use artificial lighting only, reinforced by germicidal lamps to take the place of nature's sunshine with its emotional and physiological uplift; are we going to have plastic floors and trim or do without the latter entirely? Will we dispense with gas and electric stoves and substitute radiant and short-wave heat for cooking; will we use panel heating in place of radiators and convectors and do away with "ventilation"; will we discard chalk or writing boards and use writing visible only by certain kinds of "light," and which will fade out itself after a brief period? We can cite many other factors which have been mentioned as possibilities from time to time, and often in all good faith. Note: Atomic energy, U-235, plutonium and splitting the atom (not the infinitive) have not even been mentioned. Such is progress.

Such questions as these, and their implications, confronted the editors and all of us for that matter, and it was decided to contact the field involved to see if any answers to the implied questions would be forthcoming through actual knowledge of the local situation, a possible program either already formulated or in process of development, and some detailed information as to the facilities desired or involved.

The writer of this article assisted the editors of the SCHOOL BOARD JOURNAL in this respect and as a result a questionnaire was sent to a large number of school administrators in cities of 5000 population or more, some months ago. This was followed by a shorter and simplified question sheet which called for expressions and comments and this and succeeding articles are based upon the replies received and kindly submitted to and at the disposal of the writer.

The School Executive and the Postwar School Building

It has been an interesting experience to look over and assimilate the information volunteered in over 600 replies some of which have given quite detailed material, some only giving rather obvious high lights, and quite a few either hedging or simply stating they don't know. One group frankly leaves nearly all planning and rather important details to the architect, "who knows best and more about this than I do." One may be pardoned to ask, academically at least, "Does he?" We hope that the trend among administrators is not to take this way out of a responsibility and, "let George do it." We are not referring to paint specifications or mortar type or sash details or depth and size of footings; nor does one expect the schoolman to figure out the radius of gyrative of columns or beam stresses. These as well as the hundreds of structural details which must be worked out by the technician, are matters properly belonging to the architect and engineer.

On the other hand we do not feel that ignorance is bliss 'n 'tis folly to be wise in reference to a program which oftentime assumes very large financial proportions. Does your school administrator know the advantages and disadvantages of the different systems of artificial lighting? Has he any ideas what types of classroom flooring give good results and have lasting qualities? Has he any knowledge of the effect of different kinds of acoustical materials and in what areas they should be used? Has he weighed the advantages and disadvantages of the different types of heating and ventilations or does he take what is given him? Does he desire illumination of the order of 10 foot-candles or 50, and does he know what results such intensities produce in the classroom? Does he appreciate the difference between the various elements

[1]Madison. Wis.

that go to make up a first-class sanitary toilet room? Does he know what is really desirable in the way of fitments and arrangements of shower and locker rooms? Are single or double lockers desirable and why? Is he familiar with the various types of schoolroom seating and why one type is preferable to others, and is he at all familiar with the requirements of the coming (it is here, of course) audio-visual types of instruction and quarters or facilities required for it? Or will he leave most, if not all of this, to the architect? Let us hope not, and in fact many *are* versed in these matters to some extent, but certainly not enough, to judge from the replies received.

Factors in Successful Schoolhouses

Of course one does not expect the administrator to know everything about the construction of his school building; that goes without saying. On the other hand he should know a good deal about the many features which contribute quite directly to the (his) educative process and which make possible for it to become efficient. Environment of the right kind *does* contribute to this process even if there are those who rather belittle the effect.

These paragraphs have therefore been written on the basis of the impressions which the writer, and others, have received from a study of the questionnaires' answers, and they are not to be construed as an indictment of those who have not had the time and used any effort to reply, even if in part only. But rather have they been set down to call attention to the very large number of items which make up a school plant and with which the schoolman should be fairly familiar — 40 or more areas, about 25 important construction items, 360 or more items, and combinations of equipment, and over 90 rather comprehensive trends. And this is by no means a complete list but touches only upon the more obvious and important items. Many specialized items of equipment have not been included in the above number and may well be left to the instructor in charge; but there are enough left which should, in most cases, be decided upon by the administrator, again through consultation with the teachers and the architect or technician.

The inferences of all these statements should be quite obvious to the reader and administrator and need not be discussed at this time because they *are* obvious. May we therefore close this section of this paper with one comment — it is suspected that the readers of the two questionnaires previously referred to may have undergone a liberal education so far as school-building planning and construction and equipment are concerned, and in fact several have made this same comment to the writer. The cognoscenta may skip this!

Now let us see what factual material we can gather from the replies received as well as from other sources: First, the extent and scope of the school-building program.

Extent of Postwar School Construction

Right here we are entering more or less upon a guessing contest; surely it is more or less of a guess. In the first place situations change almost hourly. Expansion programs which were in a very large plastic stage have jelled over night; shifting of warworkers is entering the picture and is modifying it at a rapid pace; modernization of existing facilities is being planned day by day; the impact of the war's educational program is also being felt — and let one frankly state, planning of many school structures

I. GROUP TABLE OF POPULATION AND ENROLLMENT

Group	*Population*	*Enrollment*
1	38,063,526	6,927,712
2	23,666,713	5,266,869
3	38,662,304	6,544,342
4	17,049,343	3,612,825
5	3,514,883	756,289
6	10,368,382	3,184,569
Totals	131,625,151	29,344,606

and expansions is in quite a few instances definitely modified in hope that federal funds for construction will be available. We have knowledge of such in more than one instance. So we cannot count on too much authenticity for determining the volume of the school construction through reports, even in the immediate future. So we will still have to estimate, or is it guess?

In the early part of 1944 one well-known magazine set the then estimate around a half billion dollars for public school buildings. Since our V days this estimate has become quite insignificant, and only lately the writer was assured by someone "in the know" that five billions was not too high. The Reeves report went up to nine billions for its estimate for a possible ten-year period, while Hamon's estimate gave about the same amount. It has also been reported that the estimate of the Association of School Administrators faced progress to the tune of nearly two billion dollars. So there we are.

Now let us see what our second questionnaire provided in the way of cost estimates. (This called for lists of projects of all kinds in contemplation and in quite a few cases in the blueprint and specification stage as well as a number of projects left in the backwash of the PWA.) The total replies received were, up to date, about 16 per cent of those sent out, nothing to brag about; and of these 22 per cent reported no program contemplated while the other 78 per cent reported on 1038 school constructions of

II. NEW CONSTRUCTIONS, EXCLUSIVE OF ADDITIONS, ETC., BY PER CENTS

Group	*Elementary*	*Junior high schools*	*Senior four-year high schools*	*Proportionate totals*
1	16	23	20	18
2	9	7	12	10
3	38	34	44	39
4	13	11	9	13
5	13	10	7	10
6	11	15	8	10
Totals	100	100	100	100

various types at an estimated cost of $268,023,000. This included 358 elementary schools, 66 junior high schools, 46 senior high, and 84 four-year high schools, a total of 549 new schools at an estimated cost of $199,560,000. Then there are reported 385 additions and modernizations at a cost of $52,022,000. To this are to be added 100 other projects, such as gymnasiums, auditoriums, stadiums, field houses, vocational schools, junior colleges, etc., with a cost estimate of $16,181,000, thus bringing up the total to the 268 million mark previously mentioned.

Though we have more or less authentic data from only one sixth of those contacted (why no more replied is left to the reader's imagination and conjecture), nevertheless there are enough cases and a good geographical distribution to warrant the assumption that the reported cases and their ratios of different constructions may reasonably be counted upon as a basic for those communities *not* reporting.

Vast Cost of Program

Strictly speaking, this will not be accepted by the statistician as very defensible mathematics, but nevertheless we will accept it for argument's sake, even if the "probable error" may and will be very high. On this assumption we are dealing with something like 6000 projects, whose estimated cost would be on the order of $1,600,000,000, an estimate below that of others already mentioned. This, of course, does not include the items in the more strictly rural areas, nor those in communities of less than 5000 population; very likely their programs will be very extended and entail hundreds of millions of dollars, to say nothing of the universities and colleges, which will further swell the totals. But authentic estimates here are difficult to obtain and in most instances lead to a wild guess. Nevertheless a very material sum may be added to our original estimate; how much, aye, there's the rub. Let us compromise on another $500,000,000 program for the above groups. This then adds up to over two billion dollars. And similar to the customary warning the novelist or author gives his readers, "This is simply my guess or opinion and no responsibility is involved."

Being of an analytical frame of mind (one is sometimes accused

The Ottumwa, Iowa, Public School Management Plan School Building Program

Standing, left to right: Walter McLain, secretary-business manager; A. W. Trautwein, treasurer; Edna Lawrence, director; L. A. Reedquist, director; Dr. Harry Wing, vice-president. Seated, left to right: H. V. Wilson, president; Dr. G. W. Loerke, director; S. G. Rickard, director; C. D. Evans, director; Frank Douma, administrator.

Launching of a schoolbuilding program to replace one elementary school in use between 60 and 70 years serving Ottumwa children, a new elementary building in Wildwood, a rapidly developing residence district, and two large junior high schools, one in the East End and the other in South Ottumwa, together with the possibility of establishing a junior college, are among the problems now before Ottumwa's school administration. Special elections will express the people's choice on the question of new modern buildings and expansion of junior high schools with proper facilities and equipment in each section of the city, as well as their decision on having their children attend junior college in their community.

of using the phrase as synonymous for curiosity) the writer noted with interest the project and financial distribution by geographical areas of the country. Six areas were selected on a more or less arbitrary basis: (1) eleven states in the eastern section; (2) nine in the southeast; (3) eleven in the middle west; (4) six in the southwest; (5) six in the west; and (6) five in the Pacific area. No excuse is offered for the division nor is any statistical accuracy involved. Table I gives some data involving the various groups.

The projects under discussion are in three classes only, elementary, junior high schools and senior four-year high schools. No additions or modernizations, etc., are included. Tables II and III

III. COST ESTIMATES BY PER CENTS

Group	*Elementary*	*Junior high schools*	*Senior four-year high schools*	*Proportionate totals*
1	13	22	26	20
2	7	17	9	8
3	46	32	45	43
4	11	14	8	11
5	12	13	5	9
6	11	12	7	9
Totals	100	100	100	100

show the percentage distribution in the different geographical groups for the three types of construction.

One could spend a lot of words and time in analyzing the contents of these tables and try to get at the whys and wherefores, but that may safely be left to the reader. We shall just call attention to the outstanding data of groups one and three, whose populations and school enrollments are virtually on a par; one is comtemplating over twice the number of projects that are recorded for the other and the cost estimates are likewise in the same ratio. How about the cost distribution for the elementary schools in the same two groups; how about the proportionate junior-high-school construction ratio in group six? Some answers seem obvious, others take time and investigation. However we are giving the information in the tables for what they may be worth to the reader.

IV. AVERAGE COST ESTIMATE FOR PUPIL AND COST RANGE

Group	*Elementary*	*Junior high schools*	*Senior four-year high schools*
1	$546 ($250 — $ 875)	$715 ($400 — $1,000)	$900 ($350 — $1,200)
2	$306 ($200 — $ 800)	$425 ($250 — $ 550)	$544 ($250 — $ 900)
3	$558 ($200 — $1,000)	$673 ($500 — $1,100)	$780 ($350 — $1,200)
4	$375 ($250 — $ 800)	$440 ($300 — $ 700)	$581 ($500 — $ 700)
5	$397 ($200 — $ 700)	$600 ($500 — $ 750)	$625 ($350 — $ 900)
6	$436 ($250 — $ 600)	$530 ($350 — $ 750)	$690 ($500 — $1,150)

Costs and Comprehensive Planning

As fundamental to this paragraph, only those projects were listed which gave fairly accurate data (*sic*) both as to cost and pupil capacity of entirely new schools. The academic questions arise: (*a*) How complete and comprehensive *are* the proposed buildings? (*b*) What is the estimated per pupil cost? (*c*) Does such cost reflect comprehensive planning? (*d*) Do the costs vary in the different geographical areas? (*e*) What is the cost differential between the three kinds of schools tabulated, etc., etc? Of course, the data submitted are not of a nature which can be used categorically as answers, and likely no questionnaire can ever be produced which *can* answer these questions. By implication, some of these questions may be answered, but, of course, such assertions must be subjective in the very nature of the questions and therefore discounted by the analyst and the reader. However we are giving some data in Table IV and will leave the ultimate interpretations and inferences, as just suggested to the reader. *Caveat lector!*

But we shall not shirk our duty too much in this respect but just call attention to a few facts which emerge from the table, even if we do not interpret them here or at this time.

In general, the highest estimates are found in group one for all types of structures, with group three running a close second. On the other hand, the southern sections, groups two and four, give the lowest estimates while the western sections approach the higher estimates of groups one and three. How about comprehensive planning, construction materials, rich states, plenty of money and — but we almost forgot and started to conjecture.

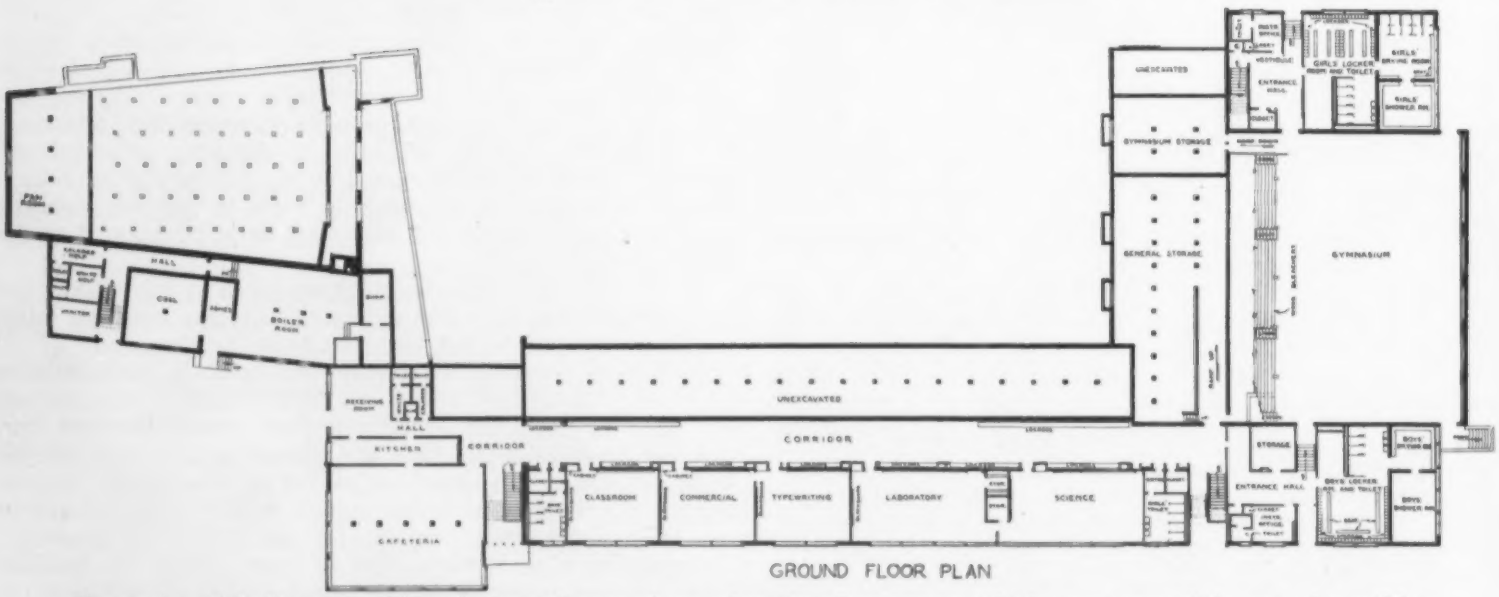
Interesting also, is the *spread* of costs among the building types — in group one the outside spread is $354, the widest of the whole table, while the least is found in group four, the west section of the southern states. The widest *range* is found among

(Concluded on page 85)

Oak Ridge, Tennessee, High School as seen from the athletic field. Photographs by Hedrich-Blessing, Chicago. Courtesy of United States Engineer Office, Manhattan District, Oak Ridge.

Planned for War and Peace Time Use

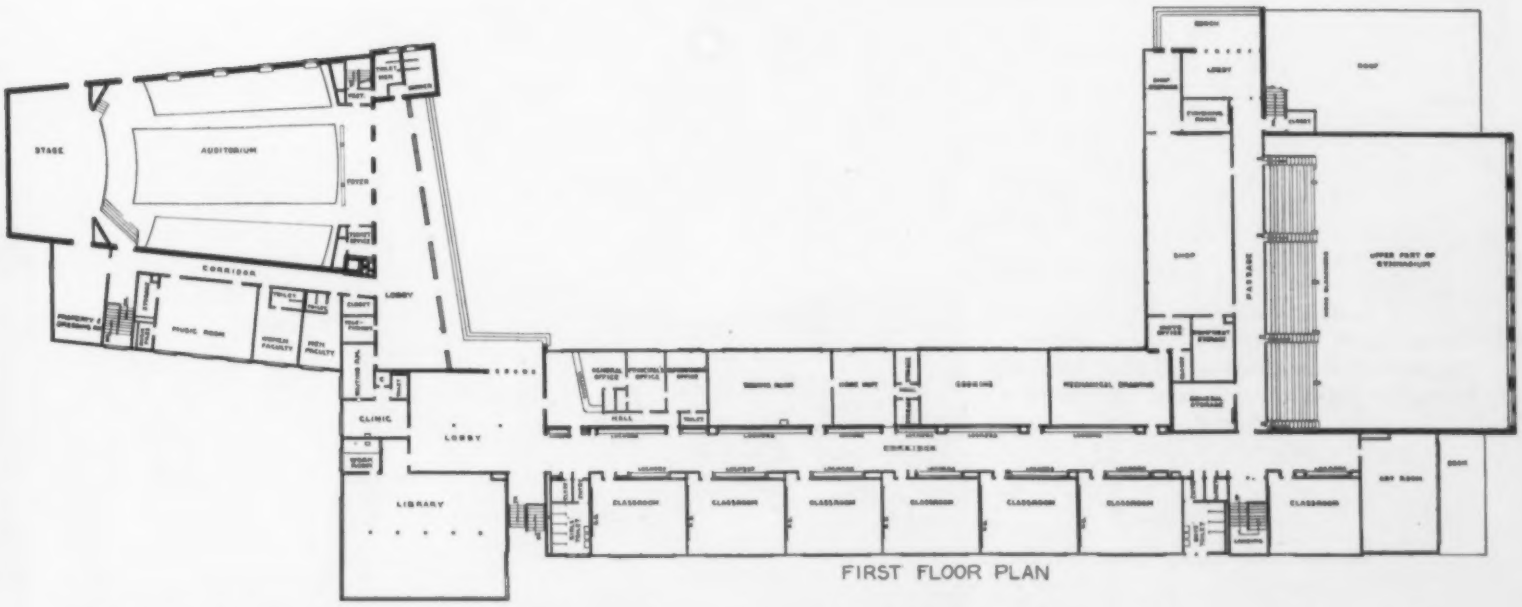
Oak Ridge, Tennessee, Schools Helped the Development of the Atomic Bomb



GROUND FLOOR PLAN

Planned and built to provide a balanced secondary education for a town which grew overnight out of a wilderness, the Oak Ridge high school has all the physical equipment which also will make it permanently an excellent center for adult education and recreation. The hilly site, which is centrally located, suggested the placing of classrooms along one side only.

The Oak Ridge High School is extremely inexpensive with its brick lower walls, asbestos sheathed wood construction, and simple interior finish. For ventilation in hot weather the top and bottom sections of classroom windows open outward.



FIRST FLOOR PLAN

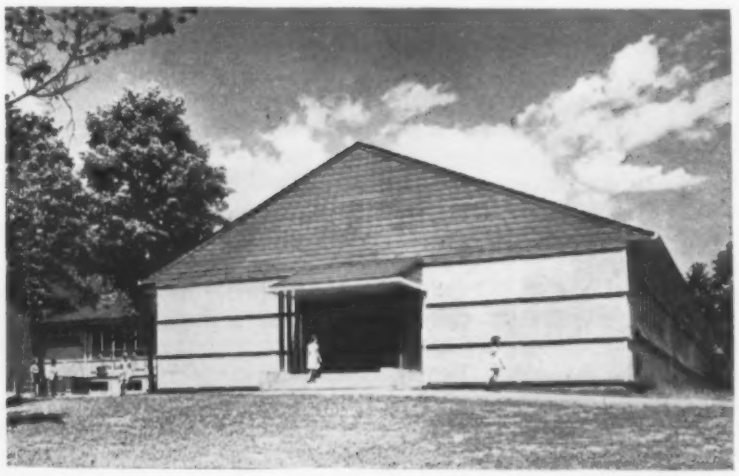
The auditorium and gymnasium, which may be used separately from the classrooms, etc., are at opposite ends of the building, with wide lobby entrances from the street side. The administrative offices, lobbies, and stairs are planned for easy access and travel.

The Cookery Room of the Home Economics Laboratory is arranged on the unit plan.

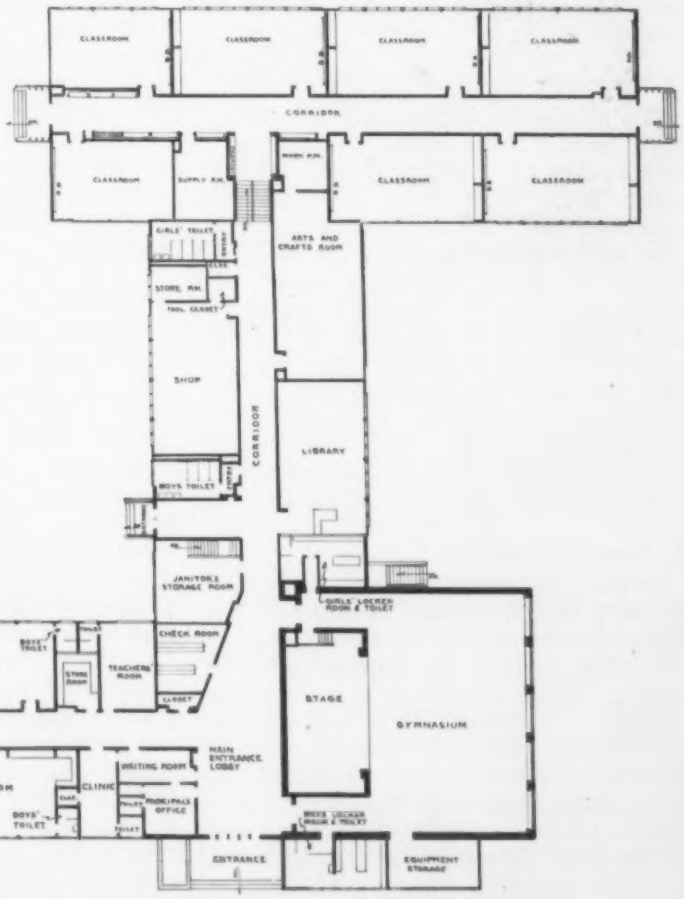
The auditorium has cement block walls and acoustic tile ceiling, and a stage fully equipped for school entertainments and theatricals.

Close-up of Elementary School showing window arrangement, roof overhang for light control, and ventilator openings.

General View of Elementary School Building, Oak Ridge, Tennessee. The buildings, which are conveniently located near the centers of the residential neighborhoods, are uniformly one-story high, built with brick and cement block gymnasium-auditoriums, wood and asbestos construction. Classrooms for primary grades have unit toilets, a work alcove, built-in bookcases, and movable seating.



The kindergarten, which includes a separate restroom, has an independent entrance.



Typical Floor Plan of Elementary School Building showing attention given to location of shop, library, combination auditorium-gymnasium, offices. — Skidmore, Owings & Merrill, Architects, New York (Oak Ridge, Tennessee).

Building Facilities for Audio-Visual Education

D. F. Schutte, M.A.[1]

In view of the current trend toward the increasing use of audio-visual aids in education, and the fact that many schools are planning some postwar construction, it is evident that some effort should be directed so as to provide building facilities that are better adapted to the use of these aids.

Each classroom should when feasible be so constructed and equipped as to make possible the optimum use of audio-visual aids in all instances in which such aids can be used to good advantage in the instruction of the pupils.

In answer to the question "What building facilities are needed to provide adequately for the use of audio-visual projection equipment in school classrooms?" it can be stated that a room is needed which is of the correct construction and size, as determined by the acoustics, the types of projectors and screens used, and the angle of vision. In planning classrooms such factors as wiring, and the location of electrical outlets, method of ventilation, provisions for darkening, and needed storage space should not be overlooked. A list of recommendations related to the above stated points follows:

1. Acoustics

To obtain the best acoustical results a room should have dimensions bearing a relationship of 2-3-4, or 2-3-5; however other factors may make it desirable to construct and use rooms of other sizes. The ordinary classroom (22 by 26 by 12 or 22 by 36 by 12) will produce very satisfactory acoustical results if drapes are used to cover about one third of the wall space, or if acoustical tiles cover most of the ceiling. If the little theater or the auditorium are to be used for sound-motion pictures, the ceiling should be covered with acoustical material to attain the best sound reproduction and transmission.

2. Type of Projector

In selecting projectors for classroom use, the focal length, wattage, picture size, and projection distance are factors that must be considered so that the projector is to be adapted to the size of the room in which it is to be operated. Much valuable information on these points can be obtained from tables published by manufacturers of audio-visual equipment. Although various combinations of lenses and projectors can be used, the following list suggests some types of projectors that would produce satisfactory results in the ordinary size classroom:

16mm. Movie Projector — 750 watt lamp, 10-15 watt amplifier; focal length, 2 in., picture size, 4½ ft.; projection distance, 24 ft.

35mm. Filmstrip Projector — 200–300 watt lamp, focal length, 4 in.; picture size, 3.4 by 4.5 ft.; projection distance, 20 ft.

2 by 2 in. Slide Projector — 300 watt lamp, focal length, 6 in.; picture size 3.0 ft. by 4.6 ft.; projection distance, 20 ft.

3¼ by 4 in. Glass Slide Projector — 1000 watt lamp, focal length, 10 ft.; picture size, 3.4 by 4.6 ft.; projection distance, 15 ft.

6 by 6 in. Opaque Projector — 1000 watt lamp, focal length, 18 in.; picture width, 4½ ft.; projection distance, 15 ft.

The type of projector, the focal length of its lenses, and the projection distance determine the size of the picture that will be produced. The size of the picture should in turn determine the width, and distance to the screen, of the front and back rows of desks, or the angle of vision of the seating. Some recommendations are listed here:

Front row of desks — maximum width two times the width of the picture; minimum distance from the screen two times the width of the picture.

Back row of desks — maximum width six times picture width; maximum distance from the screen six times picture width.

Angle of vision — not to exceed 25 degrees.

3. Screen Sizes and Types

The use of the matte type screen is desirable where viewing angles up to 45 degrees and over are encountered. The beaded-type screen should be used only when the angle of vision is less than 25 degrees. The bead-type screen when viewed within an angle of 20 degrees is brighter than the matte type. The size and seating arrangement of the room are the principal factors to consider in selecting a screen that will produce the most brilliant picture. Screen size needed will vary with the type and location of the projector. For the ordinary classroom it is desirable to have a picture width of about one sixth the distance from the back row of desks to the screen. If commercial screens are not available, a suitable screen can be economically made by painting a section of the wall with several coats of flat white paint. The screen should be located in the front of the room and mounted so that the bottom of the screen is at the eye level of the seated class. Generally the portable type screens are preferred to the built-in type for classroom use.

4. Wiring

Projectors with lamps of 750 watts or less can be operated from ordinary lighting outlets. The 1000-watt lamp requires an outlet of 10-ampere capacity. Two electrical outlets are needed and should be located at the center front and center back of the room. The outlets should be placed about two feet above the level of the floor. It is also convenient to have a light switch near where the projector is to be located so that overhead lights can be readily turned off and on.

5. Ventilation

Various types of fans and blower systems have been used with some success in ventilating rooms used for projection purposes. The unit ventilator is perhaps the most satisfactory means of ventilation in that it allows for the easy adjustment of the needs of each individual room. Good ventilation is more important than total darkness.

6. Darkening

Picture brilliance is directly proportional to room darkness. General room light should not exceed 1/10 of a foot-candle. Several methods of room darkening have been used rather widely. One method is the use of individual dark shades with folding side boards to eliminate the cracks of light from the edges. Another method is to have the ordinary dark shades mounted so that they overlap each other and the window frame. The sliding drape method of darkening has proved to be satisfactory and is frequently recommended because of its speed and simplicity of operation, and the added acoustical damping which it provides.

7. Storage Space

Suitable space should be provided in the classroom for the storage of projectors, films, etc. This space need not be fireproof. The storage space should be well ventilated, free from dust, and maintained at a temperature of about 70 degrees. There will be some variation in the space needed depending on the extent of use of audio-visual equipment. A list of storage spaces that could be used is as follows:

For 35mm. film strips — cabinet space consisting of three shelves mounted at a 45-degree angle, 8 in. apart. The shelves measuring 3 ft. by 8 in. should be drilled so as to provide countersunk holes 1½ in. in diameter for the film containers.

For 16mm. movie films — cabinet space consisting of 30 compartments measuring 2 by 10 by 10 in. for 400-ft. reels, and 15 compartments measuring 2 by 18 by 18 in. for 1200-ft. reels.

For 3¼ by 4 in. glass slides — storage space consisting of 8 drawers measuring 3½ by 4½ in. by 2 ft.

(Concluded on page 85)

[1]Director of Visual Education Public Schools, Red Wing, Minn.

Designing and Creating Tomorrow's Schools

Virginia F. Matson and Edward J. Matson[1]

Tomorrow's schools will throw off the rigid confines of massive brick walls, long and dark corridors, monastic cubicles, imperious bells as tomorrow's citizens will throw off two-dimensional transportation, regimented behavior, and ugly, cramped houses for living. Tomorrow's learning will take place among a group of bicyclers atop a windswept hill, on an ocean transport plane or a ship in a foreign harbor, in a refitted railroad car pulled up beside a factory siding, in a trailer parked in a fruit-laden orchard during the harvest season, as well as in a community classroom. Tomorrow's classrooms will be simple, flexible, inexpensive units in a center of community living. They will be laboratories for learning to live in tomorrow's world. They will provide opportunities to exchange experiences, develop happy, well-adjusted personalities, build responsible creative citizens. Tomorrow's schools will be lightweight in structure but not in ideas. They will be evenly lighted always with the intensity of daylight. They will be formed of plastics, laminated woods, strong, light alloys, and high-tensile-strength steels. Spaces will be integrated and will flow freely into one another and the out-of-doors. Folding partitions, large glass areas, movable and stackable furnishings, and ample storage spaces will simplify the work of creating educational surroundings to meet all needs. Gay colors, clean washed air, soundproofed floors, hose-washable surfaces will contribute to the joy of living in tomorrow's schools.

Before such schools can be, there must be a meeting of the minds that can create the space, the walls that surround it, and the ideas within it for these schools which we need. The community can provide the space, architects the walls, and educators and community leaders the ideas, but they must work together to create the schools.

Two Schools Contrasted

Visits to a number of schools in the past years reveal that the absence of such a meeting of minds has resulted in the one-sided development of many a school which does not serve its community. In Chicago stands a huge four-story factorylike school with a postage stamp campus. The front of the building is indistinguishable from any other factory in the overcrowded community. Yet inside that building an educator is trying desperately to liberate the minds of that community from their cramped dingy environs. His is one of the recognized, outstanding educational programs in the country. His community of diverse economic and cultural opportunities and backgrounds needs a center for the exchange of experiences and development of its civic and cultural resources. Many conference rooms and wide play areas are needed, together with facilities for many small group and individualizing activities, to release expanding developing personalities from inadequate community and home living spaces. Not that any facility has not been used to its best so far. The campus is green and cultivated to parklike beauty, an oasis on a treeless carline. Community leaders and parents are sandwiched in for conferences with teachers and students whenever classrooms are free. The three huge gyms are used 12 to 14 hours a day. Small groups work in corners of corridors, in tiny work and storage rooms, and the four corners of classrooms, and individual conferences are held eight to ten at a time in one room.

By way of contrast another school visited was structurally designed by one of the world's greatest modern architects, with the finest of materials and equipment, to function for all the most advanced educational methods. But everywhere in the school were evidences of the most rigid soul-destroying techniques of education, blanket rules, Prussianized formality, stern discipline, demanded conformity, textbook teaching, ivory-tower isolation of the pupil from the work and life of the community and world. Movable desks were lined up in fixed rows, cupboards gave no indication of their use or what was in them, posted grades were in meaningless letters, light was screened out by heavy draperies, the magnificent campus was bare in the middle of the day of a single living soul with the exception of a few gardeners and a ferocious goose and clutch that chased us away as belligerently as the forbidding aspect of the educational philosophy.

What a crying need for the meeting of minds in both of these communities before a school was built! Not only was there need for an architect and educator to meet, but for community leaders, engineers, skilled designers, parents, and thoughtful young people to determine both the structure and the philosophy of the school and to integrate it with the activities of the community. The schools of tomorrow need not be so wasteful of the money, energy, and personalities of the growing future men and women of its community.

Philosophically all trends in education point toward an increasingly realistic program of education which will equip young people to live richly and purposefully. Whatever educationl means are employed, few will question this goal.

Taking the School Outdoors

In recent years the classroom has had to be abandoned because at times it could not move with the tides of people and with the opportunities for real-life experience. In the spring of 1940 a teacher and twenty pupils put their bicycles in an airplane and flew in a few hours to an area of our country in which are highly concentrated historical sites and lore. For a week they bicycled through the scenes of our nation's great past, reviving and re-experiencing the problems of their forefathers as they camped and ate and traveled over the same terrain. A number of years ago the whole upper grade section of a large metropolitan high school transported itself for several weeks to a mining area and lived, worked, and studied in this area to become acquainted with a part of this world that books could never have brought to life for them. During the recent blitz upon England, vast numbers of metropolitan children were evacuated to all parts of the countryside. They went to castles, farm homes, small villiages, and camps. They learned to eat different foods, speak different dialects and even languages. They worked in fields and gardens, learned to harvest, and to recognize plants and animals never before seen outside of books. In America, once a year, a converted baggage car rolls out of an Eastern community at the back of a transcontinental train. Equipped with sleeping and cooking facilities for about a score of young people and with room for their bicycles, they are leisurely conducted across the whole width of our continent. From time to time the car is unhooked and the bicycles set out for travel to spots of beauty, historically worth-while sites, factories, museums, cities and other areas of educational value. In these experiences there is recognition of the need philosophically for a more flexible definition of a place for learning.

As ideas have grown educationally, modern design, engineering, and science have developed materials for creating walls around spaces of learning that will release the spirit and energies for creative living more effectively than ever before dreamed. New materials, new uses of old, new concepts of space and its relationship for indoor and outdoor living, new engineering techniques for efficiency, new knowledge of sanitation and health, and new understanding of the values and development of the human personality are available to be incorporated into dwellings for tomorrow's schools.

[1]Mrs. Matson is chairman of the Science Department at Wells High School, Chicago, and Dr. Matson is research chemist for Abbott Laboratories, Lake Forest, Ill.

Still there must be a meeting of these two developing fields to analyze and to sift through all these valuable new types of educational experiences and the materials to surround them. The philosophy of the community, the materials and funds available to create the settings must be worked out to meet the needs of all. Tomorrow concrete and brick and steel need not hold education in an earthbound shell.

A Future Schoolhouse Sketched

As an example of a school for tomorrow's enlightened, moderately well-off community, why not sketch in the outlines of development and opportunities? In an area of not less than ten acres and preferably thirty, convenient to transportation, a school and community center of fixed and movable buildings, and equipment would be developed in a garden setting of parks and playgrounds for all ages. The educational program for children might in a small community include all groups from nursery school through junior college on one site. In larger communities it would be better to have numerous small primary schools for the younger children nearer their homes and have the children start at the community center at the junior high school level.

After a sufficient period of study and planning during which representatives of all types of activities in the community, economic, social, and civic, have contributed their ideas and outlined their needs, the architects and educators would get together and develop plans and costs and specifications for the types of structures needed to meet the needs and ideas of the community. Perhaps, to meet a budget, a long-range program of building might be outlined to develop the center slowly enough to eliminate heavy costs at the outset and permit growth with the community. The majority of fixed building units would be as inexpensive and flexible as efficiency and safety would permit. Too many communities are saddled with monuments of the past that far outlive their usefulness but are too expensive to be torn down. As many parts of the building as possible would be standardized so that as improvements develop they could be easily exchanged for more modern equipment or structures. This is especially true of swimming pools, restaurants, plumbing, stages of auditoriums, and library equipment. In the near future much building equipment and materials will be prefabricated and architects can readily advise purchase of standard units to be added to the center.

The Larger Units

Large spatial units, such as the gymnasium, the auditorium, the library and the restaurant, would be planned for intensive day and evening use and would be located for easy accessibility to one another. They would be designed to provide different physical enclosures and lighting for change of weather and season. The vocational training centers, arts-and-crafts rooms, and learning laboratories would be grouped together for interchange of materials and equipment as simply as possible. Circulation of pupils would be facilitated by wide, well-lit corridors and stairways, a maximum building height of two stories, and ready access to the out-a-doors from classrooms. A space for development and study of the problems of home living would be provided. The music, drama, and public speaking programs would be carried on in units adjacent to the auditorium. An area would be specifically set aside for small group conferences, recreational opportunities, individual pupil-teacher study and meetings for guidance, parent-pupil-teacher meetings, club entertainments, and other small group functions. The atmosphere, particularly regarding the lighting and color used, would promote friendliness and ease. In addition to the auditorium there would be a number of smaller group meeting places, but still large enough to be further divided by movable partitions. These rooms could serve for large and small clubs, scouts, steering committees, civic associations, and class parties.

A typical learning laboratory suitable to the study of the sciences, social studies and most other subject matter would be a combination work-study unit with movable work spaces and equipment. There is little need in modern classrooms for large blackboard spaces, but much need for bulletin boards and display and storage cabinets. All should be designed to be freely opened or observed so that no work or equipment stored is hidden from sight. A single classroom unit would also contain a raised movable platform, workbench space for at least twenty people with sinks, water and gas handy to their reach, and portable cabinets on ball-bearing casters stocked with a variety of necessary tools. These cabinets could be equipped for different class needs and might be wheeled into other units when needed there to obviate the purchase of large quantities of duplicate materials. But it is to be emphasized that any learning laboratory should be so designed that any form of knowledge from chemistry to Shakespeare could be acquired there with a minimum disturbance of the classroom. Sliding soundproofed screens could divide the unit into at least four smaller units for committee meetings or other small group functions. Each unit should be equipped with drinking fountain facilities and toilet facilities for both sexes. *No pupil should ever have to leave a classroom and wander down a corridor to meet any bodily need and should be able to wash his hands freely of any grime of work before leaving any learning laboratory.*

The architecture and materials of the building would be of the most modern scientific development. Lighting would be controlled to maintain at all times the optimum amount of light in all parts of the building including the corridors. Fluorescent or an improved form of even intensity and low cost lighting would be used to supplement daylight. Natural light would find at least one complete wall of glass in every classroom to facilitate its entry. Heating would be a radiant type installed in the floors, permanent walls, or ceilings. Ultraviolet light or intermittent bactericidal sprays would sterilize the air, and all dust would be precipitated before air was circulated in the building. Floors and walls would be durable and soundproofed and easily cleaned with a hose. Newly developed forms of insulating glass would be used in wall construction where desirable. Every room would be decorated tastefully with furnishings and colors to provide satisfaction and comfort to the human beings using them. Chairs and tables in particular would be comfortable and functional. Insecticidal paints and sprays would eliminate obnoxious insects.

The Campus and Community Building Uses

The school campus would provide for all types of worth-while outdoor living for the community with model flower and vegetable gardens, demonstrations of agricultural equipment and solutions of landscaping problems. There would be all types of outdoor athletic fields within the limits of the spaces, and perhaps even an outdoor theater. Special play areas and equipment for small children isolated from the larger children would be provided. An outdoor pool as well as an indoor one would be practical in some communities and equipment could be so installed as to serve both pools. Outdoor laboratory space, in addition to that for biological sciences could be provided for sketch classes, poetry work, dancing and dramatics. Areas for rest and social contacts between classes also would be laid out.

Other functions of the school-community center that could be undertaken in addition to the numerous adult and young people activities previously mentioned or indicated would be places for community banquets, religious meetings, and memorial services, a local public-health center with medical guidance for students and adults, an infant-welfare station, a stay-well clinic, water testing laboratories, and the board of health. In an agricultural community the county farm bureau might be located at the center. A local FM radio station could be installed. Scientific research after school hours could be carried on in addition to development of numerous hobbies. A community theater, community orchestras, and singing groups could be housed as well as other group activities that so often falter and disappear from the students' lives when they leave school for lack of any facilities to continue such pleasurable group activities. Different communities would add to and subtract from these uses, and growing communities would find their needs and programs changing, but all educational facilities for a community might well be located together and be used extensively by all age levels. Costs of equipment should be computed upon the student hours of use to which it is put.

In every school center, in addition to the fixed educational equipment and facilities, there should be a supplemental program that will take the students into other communities and to other ways of living, and bring other

(Concluded on page 85)

Functional Planning: Bexley Designs a Modern Elementary School Building

Novice G. Fawcett[1]

I

The story of the development of this plan is one with a background which must be understood in order to see its significance as an integral part of a school system which serves children from kindergarten through the twelfth grade.

Bexley is a choice suburban area, entirely surrounded by the city of Columbus, Ohio, and has a population of about 10,000 people. During the past thirty years the school district has experienced a considerable growth, developing from the stage of a county school system, housed in one building, to a city requiring kindergarten, elementary, junior, and senior high school facilities. The school now occupies four buildings, one of which is quite old and entirely removed from any center of school population; it houses only four grades. Another building, originally designed as a high school unit, was converted into an elementary school when a new high school building was erected near the center of the corporation 13 years ago. This building now houses a five-year elementary school, departmentalized sixth, seventh, and eighth grades, and all kindergarten children in the system. This is the only building of the four which has sufficient classroom space and other needed facilities to accommodate the children of preschool age. The high school building houses grades 9 to 12 inclusive and is so constructed as to limit the program largely to the academic fields. A fourth building, also centrally located, now houses a five-year elementary school and departmentalized sixth, seventh, and eighth grades. This building was originally designed to house a kindergarten, elementary, and high school.

Recently a large section of the city has developed in a location far removed from any existing elementary building. This growth resulted in a condition under which small children have been forced to walk great distances to reach an overcrowded elementary and junior high school building. These are not the only children in the city who are subject to the hazards of weather, inadequate lunch facilities, and traffic on busy thoroughfares. The real problem has been to unscramble a rather confused situation, brought about by unpredictable developments.

Since the ultimate growth of this community could be predicted with a rather high degree of accuracy, it soon became apparent that more permanent plans for the future could be developed. With these facts in mind and with the results of a survey, made by the Bureau of Educational Research at Ohio State University in 1942, available for study, the board of education was asked to appoint a committee late in 1943 to prepare an approach to the problem. The committee consisted of two board members and the superintendent of schools.

An exhaustive study was made in the light of recent developments in education. The committee soon discovered that our shifting population and limited building space had forced our schools into a type of organization which needed to be completely revamped. Our first task, therefore, was to study our community and decide what type of organization would best serve its needs and interests in the future. Because of the geographical nature of this area, the distribution of school population, and the investment in present structures, our committee recommended a kindergarten-six-two-four plan.

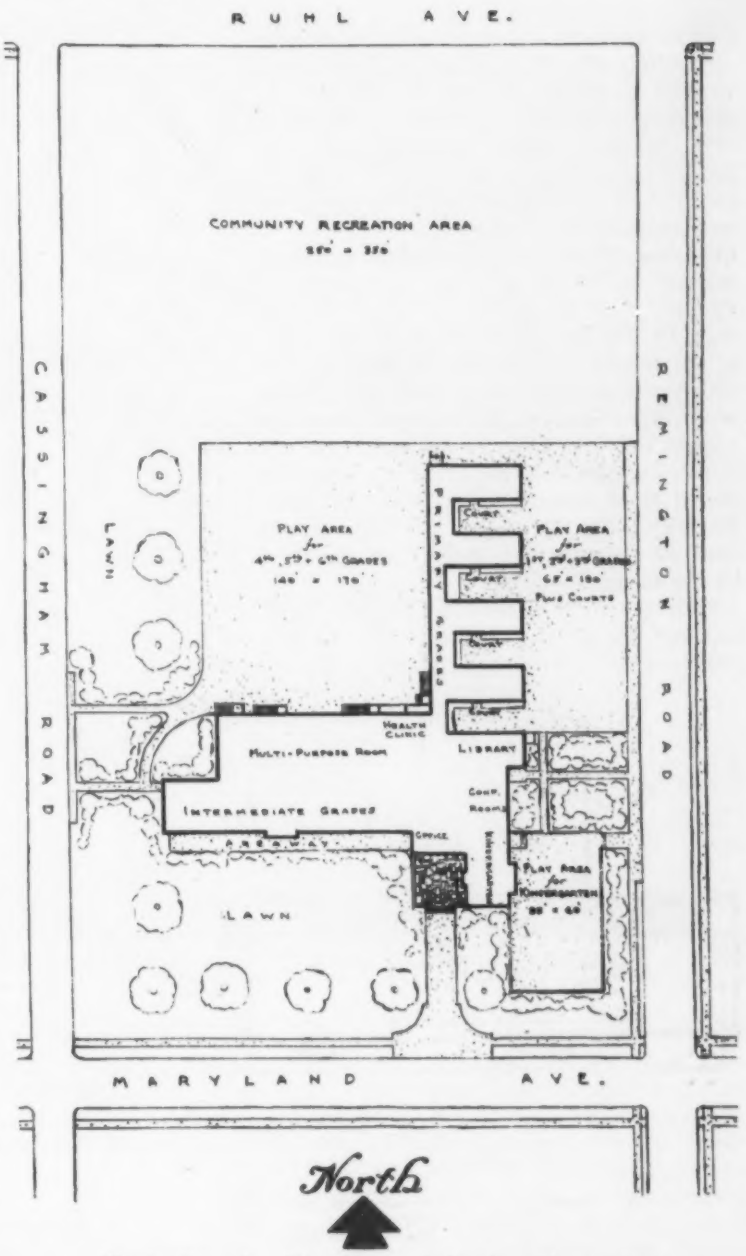


Illustration 1. Site Plan of Bexley Elementary School, Bexley (Columbus), Ohio.

This plan called for the closing and sale of one building and site, small additions to two buildings, the remodeling of one building, and the construction of an entirely new elementary building on a site acquired by the board of education some years previously. This plan was developed around the community-centered idea. Since there are three rather distinct geographic areas in this district, the new plan placed a unit for kindergarten through grade 6 in each area. The current plan of two so-called junior high schools (grades 6, 7, and 8) was abandoned for one seventh- and eighth-grade unit centrally located. The present high school (grades 9 through 12) needed a new addition to expand the fine industrial-arts areas and to provide adequate space for a clinic, school publications, musical organizations, and additional classrooms. A central storage unit for the entire system loomed high on the list of needed improvements, and the committee decided to recommend that such a unit be attached to the high school building. It is here that all books, materials, and equipment will be received and dispensed by truck under the direction of the superintendent of buildings and grounds.

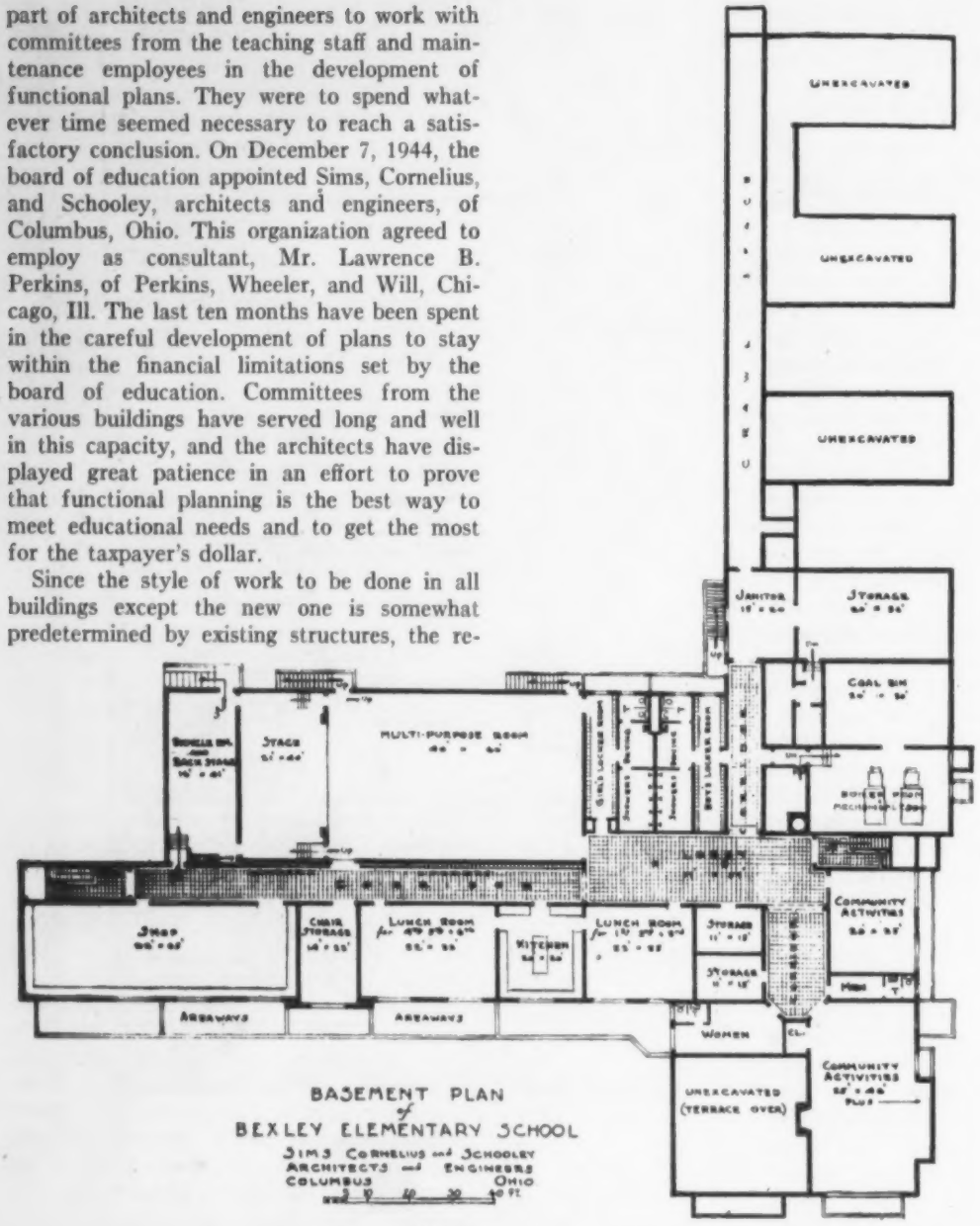
This plan received the approval of the board of education in February, 1944, and was placed before the staff, city officials, and lay groups for further consideration and criticism. During the summer of 1944 a consulting architect was employed to draw up estimates to be used in preparing legislation to be submitted to the voters. A bond issue was presented to the voters on November 7, 1944, and was carried by a vote of approximately 78 per cent.

Our next assignment was the selection of an architect. One of the necessary qualifications was a statement of willingness on the

[1]Superintendent of Schools, Bexley City School District, Bexley (Columbus 9), Ohio.

part of architects and engineers to work with committees from the teaching staff and maintenance employees in the development of functional plans. They were to spend whatever time seemed necessary to reach a satisfactory conclusion. On December 7, 1944, the board of education appointed Sims, Cornelius, and Schooley, architects and engineers, of Columbus, Ohio. This organization agreed to employ as consultant, Mr. Lawrence B. Perkins, of Perkins, Wheeler, and Will, Chicago, Ill. The last ten months have been spent in the careful development of plans to stay within the financial limitations set by the board of education. Committees from the various buildings have served long and well in this capacity, and the architects have displayed great patience in an effort to prove that functional planning is the best way to meet educational needs and to get the most for the taxpayer's dollar.

Since the style of work to be done in all buildings except the new one is somewhat predetermined by existing structures, the remainder of this article will deal more specifically with the creation of plans for the new elementary building to be known as the Maryland School. The architects contributed the illustrations for this article, an act which has been typical of their keen interest and helpful attitude during this entire period.



BASEMENT PLAN
of
BEXLEY ELEMENTARY SCHOOL
SIMS CORNELIUS and SCHOOLEY
ARCHITECTS and ENGINEERS
COLUMBUS OHIO

Illustration 2.

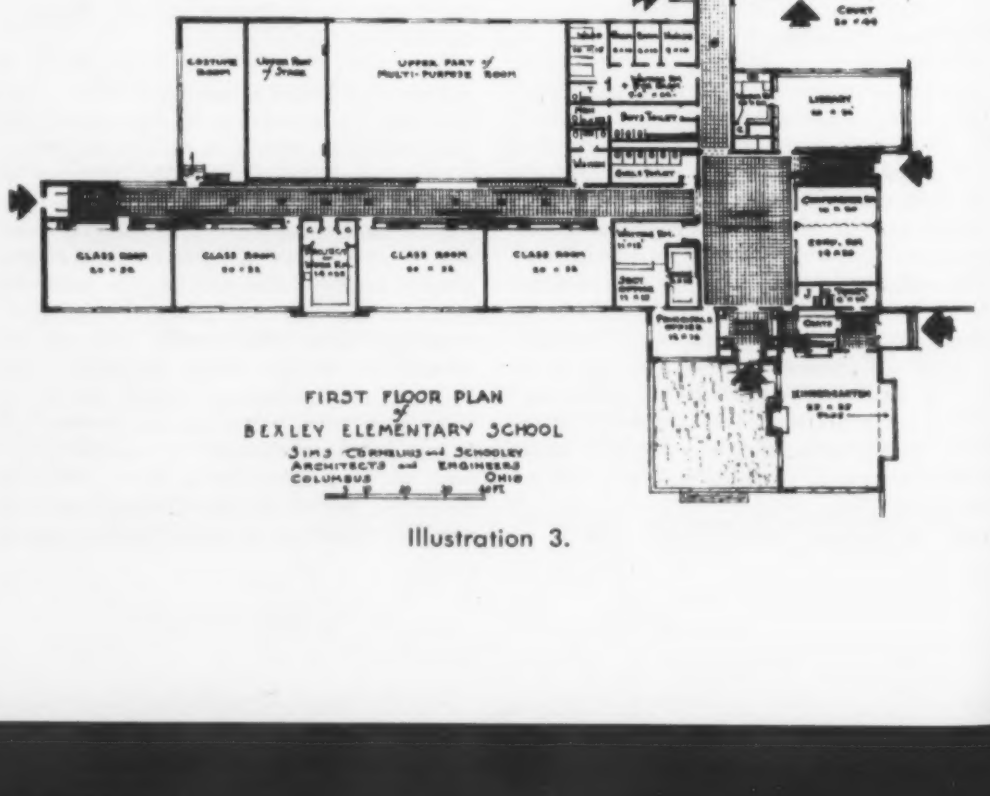
II

The development of this plan is based on the idea that, where opportunity presents itself, a school building should be the outgrowth of careful and intelligent study on the part of the board of education, the architects, the administration, the teaching staff, and the maintenance employees. A school building is a rather permanent thing and by its very nature is less flexible than a course of study. The taxpayer who expects a building to serve a specific need in a community for thirty or forty or fifty years sometimes loses sight of the fact that education is a continuous process, subject to continuous change. Therefore, our first guiding principle was the attainment of a degree of flexibility which would lend itself best to the inevitable changes that are always taking place in education. We do not wish this flexibility, however, to impose a crudeness in design or arrangement; we want to maintain some of the aesthetic values in education in a physical environment which will serve as a stimulant to child activity and development.

To fit in with the scheme that each elementary building in our district should be a center of community interest, the committees have been ever mindful of the need of space for community recreation, dramatics, health service, scouting, etc. These factors have become integral parts of the total plan and have been given careful consideration by the architects in their efforts to create a functional interior design and an exterior style of architecture in keeping with the residential environment.

The Maryland School

Since this section of our district is one in which we may safely anticipate some growth in population, it has been necessary for us to provide classroom space to take care of this possible expansion. A study of our plan will reveal that, with minor alterations and the elimination of some of the finer features of our building, we could meet an emergency increase in population of almost twice the



FIRST FLOOR PLAN
of
BEXLEY ELEMENTARY SCHOOL
SIMS CORNELIUS and SCHOOLEY
ARCHITECTS and ENGINEERS
COLUMBUS OHIO

Illustration 3.

present school population in this section. Also, the plan is one to which many classrooms could be added at a minimum cost to the community.

Since every school in our district is an integral unit in our entire system, the work in this building will be closely tied in with the work in all other buildings. Therefore, the scheme entailed a central location of administrative offices, health clinic, library service center, and parental conference rooms. As we saw our problem, these services would need to be assembled around a main lobby and would constitute a kind of hub to a wheel with three spokes, each representing a rather distinct learning level in an elementary school. The first of these is the kindergarten, which operates a little more independently of the remainder of the school than do the others. The second is the primary level (grades 1, 2, and 3), and the third is the intermediate level (grades 4, 5, and 6). Each of these is being provided with its separate playground. Each playground will be an asphalt surfaced area for year-round use, located a sufficient distance from the other areas to eliminate the problem of the common playground, and yet maintain the benefit of making adjustments to larger social groups (see Illustration 1). In addition to these three specific surfaces is a large sodded surface for whole school events and community recreation.

Recreation Room

Closely related to this phase of our health, physical education, and recreation programs is the large recreation room on the ground floor of the new building (see Illustration 2). The story of the location of this room is significant of what has happened at every turn of our whole planning pattern. It should be added at this point that our final plan is called Scheme No. 8. This scheme developed through the preparation of eight preliminary sketches by the architects in an effort to meet our functional requirements and yet stay within the financial limitations of the project.

Through continuous experimentation and study as well as through the careful selection and use of building materials it was discovered that, if the recreation room could be placed on the basement level and properly located with respect to the three learning levels and the playground, a larger room could be made available at a unit cost of approximately 55 per cent of the cost of the first-floor area. This point proved well worth consideration and became paramount in our thinking as we developed plans for a functional elementary building within an approximate financial limitation of $170,000.

Through this anticipated cut in cost it has been possible to provide a room sufficiently large to meet the need for both school and community recreation; also, this room will be used as an auditorium by providing portable seating. Both the stage and the seating area are large enough to accommodate full school assemblies and gatherings of parents to observe special programs put on by the children. On any higher learning level we could not have considered the dual-purpose room; but in an elementary school this plan is workable, more conservative, and affords more all-purpose space than could otherwise be provided.

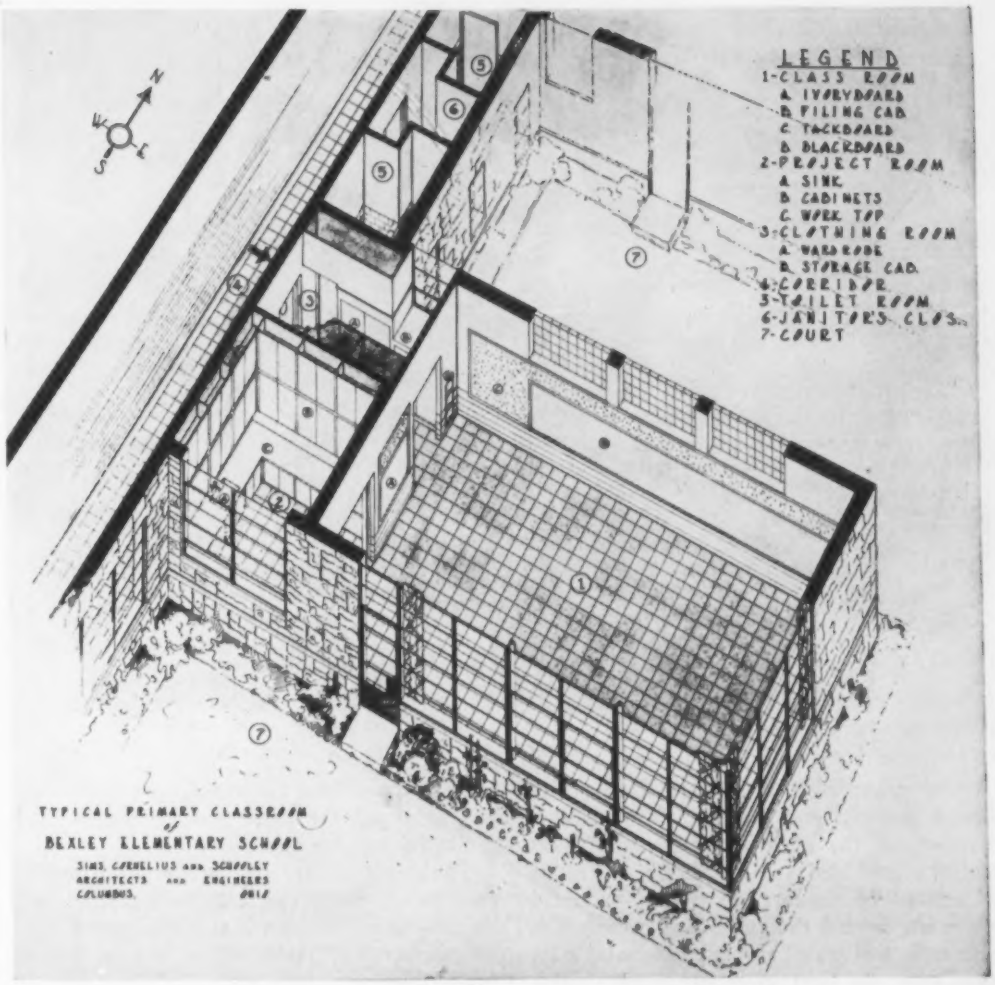


Illustration 4. Isometric View of Classroom Unit.

Lunchroom Facilities

An examination of our lunchroom facilities (see Illustration 2) will reveal a small kitchen flanked by two separate rooms. These rooms are for children of the primary and intermediate levels and will be equipped with furniture of appropriate size and arrangement. Recent experiments with classroom feeding in one of our schools convinces us that this divided arrangement is extremely important. The noon lunch is gaining in importance and is becoming an integral part of our program of health education.

Intermediate Classrooms

The classrooms for children in the intermediate grades are grouped around a small project room (see Illustration 3), designed for use by individual children or by groups of two or three children from any room on the intermediate level. It is important to retain access to such a space, even though the child is getting into more specific subject-matter fields and is experiencing less need for individual and small group activity than on the primary level. For creative arts and large group projects a well-lighted and spacious room is located directly below these classrooms, away from the more quiet classroom environment. Here groups of children will be able to explore interests in the arts without disturbing other groups. In case of emergency increases in school population, a temporary partition can be installed to convert this space into two classrooms until additional space can be provided.

Primary Classrooms

If, through our planning, we make any contribution to actual classroom efficiency, we feel that it will be in the primary classroom. Our general plan is in no way original, but careful studies have been made of the more recent developments in classroom design, and we believe that some innovations of real and lasting import have been incorporated. Illustration 4 is an isometric drawing of a classroom design based upon the versatility of the modern classroom teacher, who assumes almost complete responsibility for the whole problem of child development. Since the child is closer to the home here than on the higher levels, the home atmosphere is maintained as far as possible. The necessity for going to special rooms with special teachers is eliminated. Supervisors are supplied to help the teacher with her problems, but almost all work will be done in this classroom unit to eliminate unnecessary child adjustments and needless frustrations.

Illustration 5.

These rooms will be lighted from three sides so that bilateral lighting will be possible regardless of the position of the sun. Light from the east and south will be controlled by sections of semiopaque drapes, mounted on a track around the clear-view corner. The north light will travel through prismatic glass block with the light directed to the ceiling for diffusion. A means of shutting out north light will be provided so that each room can be darkened sufficiently for projection purposes. Sliding glass doors will separate the project room from the main classroom. This will shut out the noise from activities and retain full teacher supervision.

The group activity area will be in the northeast corner where the least natural light will be provided. Individual academic work will be conducted at tables, which can be moved to suit the need and take full benefit of the light. Group academic work can be conducted either around clusters of tables, a group of chairs, or from a seat constructed around the clear-view or bay window corner.

The care of clothing and the development of self-sufficiency are essential factors in the primary educational program. A carefully arranged clothing space is provided in the northwest corner and will be equipped to facilitate supervision and eliminate unnecessary confusion.

A common toilet for each room on the primary level is becoming a generally accepted policy in elementary school buildings. Our plan has two advantages: plumbing costs can be reduced by having one main line serve two rooms (see Illustration 3); also, by entering the toilet from the clothing room, the entrance is removed from the main classroom. This placement close to the corridor is not only more convenient but also eliminates possible embarrassment for some of the children. At the same time the teacher can give this phase of the health program careful supervision.

Other features, such as generous cupboard space, recessed filing cabinets, and an outside entrance, will add to the general utility of the room. The asphalt surface on the playground will extend from the building to the street, thereby eliminating school traffic problems. The outside area between rooms will be used for a variety of purposes during good weather.

There are two good reasons why all of these rooms are grouped along one side of a corridor: first, experience has proved that west light is less desirable in this type of room than south or east light; second, the outside wall along the west side of the corridor is a boundary for the intermediate playground and can serve as a back for handball courts and other phases of school and community recreation.

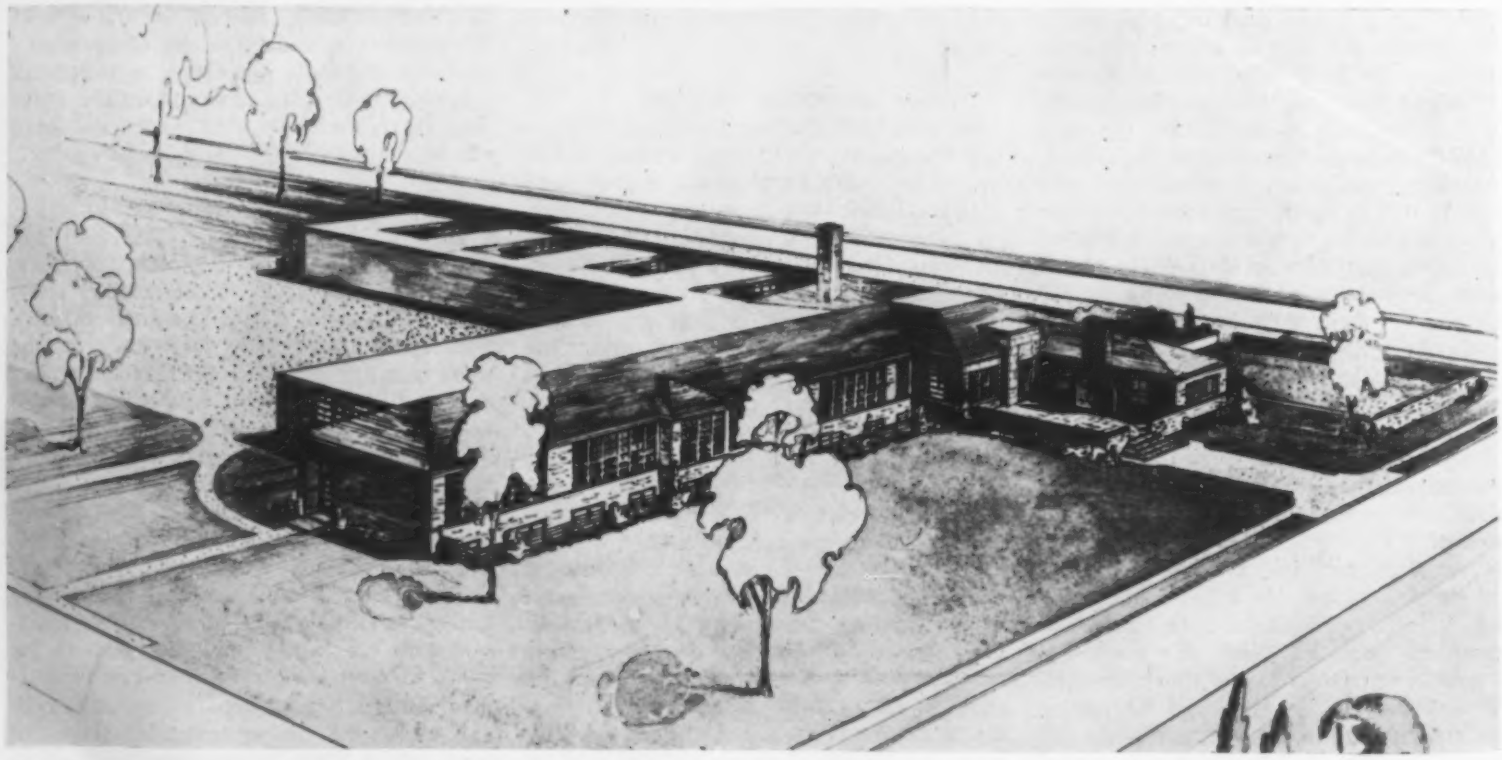


Illustration 6. General Exterior, Bexley Elementary School, Bexley (Columbus), Ohio. — Sims, Cornelius and Schooley, Architects and Engineers, Columbus, Ohio.

It has been stated that the kindergarten is a little less closely related to the entire program than are the other levels. However, many of the features described above have been utilized in the kindergarten rooms. A separate entrance is provided in addition to the entrance from the lobby. An observation booth has been located back of the north wall so that there will be a minimum of interruption for children of preschool age. The other refinements are of an interior nature and are not of special interest in an article of this type.

This building is to be done in stone to add to the beauty of the community and is designed to be in keeping with its residential environment. An exterior projection was the last step attempted and has been carefully executed by the architects in order to preserve the functional features of the interior. The general results of this type of planning can be seen by a study of Illustration 5, which is a perspective of the front entrance.

Many school buildings in this country are the result of an opposite system of planning, but we submit Illustrations 5 and 6 as proof that the functional approach does not preclude good exterior design. Illustration 6 is a general exterior or air view as the building will look when it is completed. This serves as an excellent summary to the ideas with which we have been dealing. A comparison of Illustrations 1 and 6 should give a clear understanding of our finished product.

Not much has been said in a specific way in this article about color schemes, equipment, visual education, music, and other salient features of the modern elementary school building, but much has been implied. A great deal could be written about the library as a part of our public library system, the flexibility of the conference rooms, the development of the health clinic or the administrative facilities, but space does not permit the exploration of all of these features here.

The intent of this article has been to deal with ideas in an effort to show how ideas sometime become a reality. A careful examination of the illustrations will reveal detail. For example, the size of our classrooms may be challenged, but we can defend this on the basis of providing extra activity space and small classroom enrollments.

This has been an experience in functional planning which is offered as a profitable technique to those interested in building. The board of education has been most co-operative, and supplied a committee during the entire period to work on the project and assist the superintendent in keeping them fully posted on progress. The staff has given generously of its time, and there is every reason to believe that many mistakes common to building have already been eliminated. The entire process can be adapted to public school planning only if the architects are completely open minded, creative, patient, and sound in practical thinking. We have been most fortunate in our choice and look forward to our dreams becoming reality as soon as labor and materials are available.

Importance of the Village Center in School Consolidation

*Frederick E. Bolton**

Consolidation is the order of the day. In most states thousands of small public schools have been abandoned and merged into fewer and larger districts. On the whole the mergers have been advantageous. But in quite a percentage of cases the results have probably been of doubtful advantage. While no statistical study has been made the comments from many persons in diverse districts indicate that some of the consolidations have produced maladjustments rather than advantages.

The general complaints indicate that many village and small city centers which have lost their high schools have lost their real community life. A village with a population of a thousand surrounded by a rural area with another thousand which makes the village its commercial center has sufficient population for a four-year high school of 100–125 pupils. About 10 per cent of all high schools in the United States are of this size and nearly 40 per cent more are still smaller. For a high school of 100–125 pupils there should be at least six teachers including the superintendent who should not teach more than two classes daily. While a high school with that number of pupils is too small for *ideal* efficiency it is, however, large enough to offer superior advantages in most high school functions.

Generally a larger rural area can be advantageously included in the consolidation. In an ordinary farming area probably there will be at least 2000 population from the rural area contiguous to the village. That area and the village furnish approximately 150–175 four-year high school pupils. The total school population would be about 600. With a total school enrollment of 600 in a village center, normally there will be about 360 in the first six grades; 60–75 in grades seven and eight; and 150–175 in a four-year high school.

If possible all one-room rural schools should be abandoned and the pupils transported to the village center. Most high schools with fewer than 75 pupils should be consolidated into larger units. Of course, geographical conditions must be considered. In moutainous areas or in regions where the highways are not open during all seasons, transportation is a difficult problem and ideal consolidations cannot be established. Often much of the contribution to the maintenance of community life can be conserved if the high school is small by retaining a junior high school in the village.

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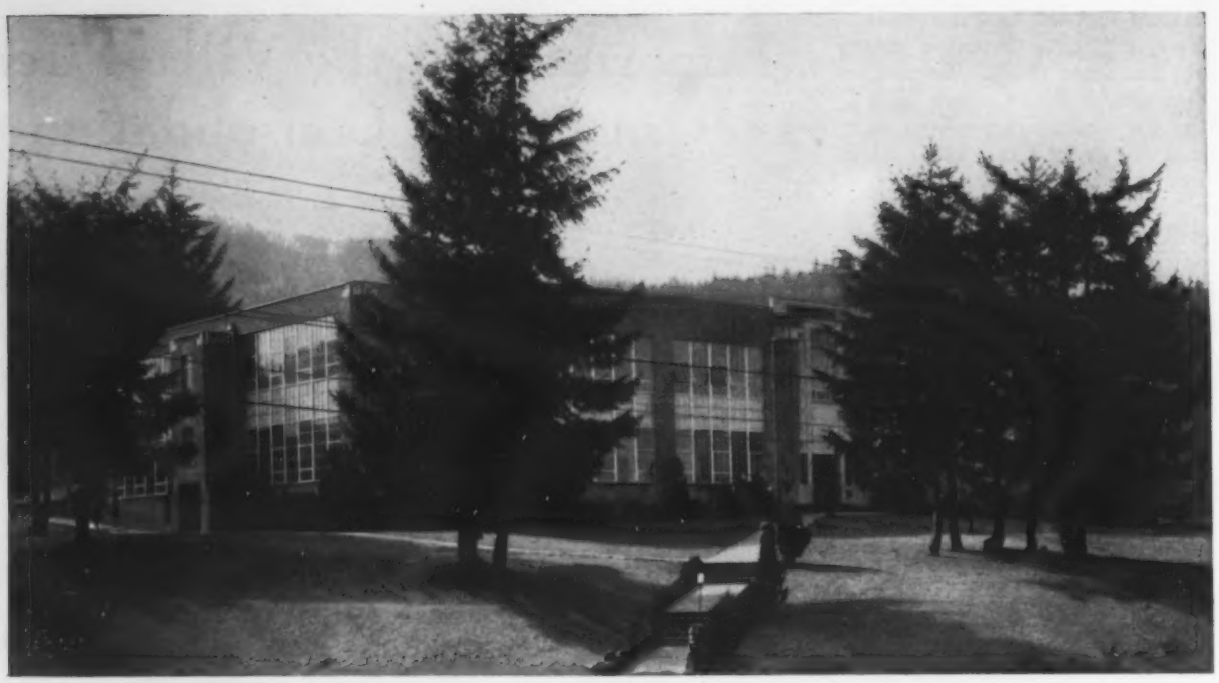
Valuable School Services for Adults

In planning school locations and organization consideration should be given to the adults in the community as well as the children of school age. Too often we think of the school as a unit of society entirely unrelated to the homes and the community as a whole. The school should be an integral part of the well-organized community. Adult education has properly come to be considered a vital need in present-day society. It is important that adults and youth should co-operate in community enterprises and that they move along together in their thinking about civic problems. This should be true not only with reference to local matters but also in larger relationships of life. Villages and small cities are more natural centers for basic democratic living than either rural farm areas or metropolitan cities.

The community high school should be the natural center for bringing together youth and their families. While the adults will not attend the schools, what is taught in the school and the manifold extra-curricular activities of the school should be a regular topic of conversation in the home. In this way the pupils profit by the ideas and attitudes of their elders. In turn the elders are educated by the ideas and interpretations they bring from the school.

In the well-integrated high-school community there will be many evening lectures, debates, concerts, and plays brought there because of the high school. Then, of course, there will be the football and baseball games, the track meets, and tennis tournaments. The vocational departments should furnish arts and craft exhibits, 4-H, and home-economics displays, etc. If the high school is removed from the village center by consolidation, there will be less likelihood of adult attendance than when the various programs are held in the village center.

Some successful consolidations have been established in the open country. To secure the approval of the taxpayers and to arrange advantageous transportation routes occasionally it may be necessary. However, a trading village center is the natural and logical nucleus. It is a necessary auxiliary contributing to the daily efficiency of the school plant. Any day emergencies may arise requiring, for example, some chemical reagents, a box of crayon, a spare part for a school bus, or a printing job. Pupils also are in daily need of school materials. Often parents can save much time if pupils can do shopping for them at noontime, thus



A typical illustration of a fine consolidated school system with its center in a small city outstanding for its community school activities is at Issaquah, Washington, sixteen miles from Seattle. The population of the incorporated city is about 1000 and the school district embraces thirteen former districts in an area of eight by twelve miles. The prevailing occupations, originally coal mining and lumbering, are now dairying, fruit raising, and vegetable gardening. Issaquah is the trading area with stores, shops, etc., and a small airport. Many of the people have been working in war industries in Seattle and nearby plants. Statistics and photographs courtesy of Superintendent Albert A. Mykland.

saving trips from the farm in the midst of a busy season.

Democratic Interaction

In a democratic country it is important to keep the school in constant touch with the home and industrial life of the community. The school should be a part of the world around it and should be an interpreter of that life and in turn a guide to higher and better standards. This should be evidenced in improved streets, greater applications of science to agriculture and industry, more artistic touches in the residences, business houses, streets and public buildings, and better hygienic conditions in the whole neighborhood. The accomplishments in the school departments of manual arts, home economics, music, and graphic arts should react upon the whole community, no less than on the school.

This reciprocity of service is enhanced by having the school in a village center. Here the people congregate from the countryside. To this place they bring their farm products. From the village they secure their groceries, clothing, furniture, and farm machinery. Here they purchase their automobiles and have them repaired. Their banking is done here. Community dances for the youth are "Saturday nite" diversions. Farmers are great "joiners" and the lodges are conspicuous in every village. In countless ways the village becomes the center for community interests and activities. The countryside is no longer one community and the village another. They are bound by innumerable ties. It is just as important for the village to have a high school as it is for the school to have a village for its base.

The consolidated high school in the village not only provides formal education for the adolescents but it becomes a civic center for the entire community. The school auditorium and the gymnasium should be available to the community in the evening, on week ends, and for many special occasions. It should be the center for parent-teacher's meetings, the Red Cross, educational meetings of the American Legion, the Boy Scouts, Girl Scouts, Campfire Girls, 4-H Youth, Future Farmers, and many other nonpolitical, nondenominational, philanthropic, patriotic, educational organizations.

In the consolidation of schools we should keep in mind the difference between an administration district and a central school. The administration district for financial purposes may be large and include several schools, even several high schools. Individual high schools should not be large at the expense of village centers that are vital to community, social, and industrial life. The development of a vigorous civic life in a village of a thousand people is as important to the state as the development of a fine high school. The continuity of the village life is as dependent upon the high school as is the dependence of the high school upon the vigor of the village. Experience shows that if the high school is removed through consolidation the real civic center declines markedly.

The total school enrollment of 960 includes 277 high school students; the teaching force is 32 teachers, 10 in high school. Buses carry 560 children daily; shortest bus route 8 miles, longest 25 miles. The elementary schools include a two-room school at Preston; a three-room school at Coalfield.

The First Problem —

What Are Your School Bonds Worth?

Herbert B. Mulford

All signs point to a considerable increase in school-district financing. At numerous conferences of school administrators during the summer sessions at universities and at recent regional and state conventions of school boards, the most popular subject for discussion has been new school buildings. In most instances the emphasis has been on the large backlog of building needs, the problems of properly choosing the building site geographically within the district, and the type of buildings needed in the circumstances. The one subject almost uniformly slighted has been how to finance the district, and more particularly what price the school boards must pay for their building money through the sale of school bonds.

This subject, if adequately treated in conferences or in school-board literature, would include the following principle points:

1. Where shall the board go to get thoroughly honest and competent advice?

2. What type of attorneys will best serve the board in guiding accurately in the legal formalities to choose building sites, prepare proper election proceedings so that they may not later be attacked by chronic tax objectors, draft legal resolutions so as to avoid any technical pitfalls, and not "gyp" the board through exhorbitant fees?

3. Where are the best markets in which to sell school bonds, or in other words, to buy the use of money?

4. How should preliminary plans be made for financing, so as to obtain the best price for the school district's securities?

5. What price must be paid for borrowed money; or in other words, what are the school bonds worth?

6. How may the district officials know when they have a good price?

In the August, 1944, issue of the JOURNAL, the present writer touched upon many of the preliminary aspects of school-board borrowing and pointed out the need for both the superintendent and the board members to inform themselves thoroughly on the broader aspects of borrowing. It is suggested that they now reread that article. But to touch upon each of the items in the above list of questions and to bring information down to date, several preliminary phases of this board responsibility are repeated here.

Most dealers in school securities buy, so to speak, at wholesale and sell at retail. That is, the district sells an entire issue of securities at a lump sum. If the total amount of the issue is not very large, it may be absorbed by one banking house, insurance company, trust fund or the like. If it is larger than will suit such purposes, the bond dealer distributes the issue in parts to the investing individuals or institutions. This is done at retail and at a price which includes a profit for the dealer. Thus there is as definite a spread between the original price obtained by the school district and the retail price as there is between wholesale and retail prices of any commodity. In planning the sale of school bonds, therefore, the school officials should be thoroughly familiar with the proceedings that will satisfy the most discriminating investors and the dealer who sells to them.

Importance of Legal Opinions

This means that legal technicalities must not only be handled precisely according to the laws of the state in which the school district is located, but the attorneys passing upon such proceedings must be so well known to the final discriminating investors that their legal opinion on the proceedings incident to the bond issue will be acceptable to the buyers. There is a vast difference between the average attorney, who may be regularly retained by school officials to guide them in routine business, and the well-known specialist with the "acceptable" legal opinion. This is no disparagement of the average attorney, who may know law perfectly. It is just an emphasis on the fact that in financing of any material size, either markets may be cut off from the school board because of unacceptable legal opinions, or the specialist may have to be employed to do the work of the regular attorney of the board all over again in order to get a "salable opinion." This means that the board must know in the first place who "acceptable attorneys" are, or pay additional fees.

The best course to pursue in respect to legal opinions is to inquire of a number of bond dealers and banks as to what firms of lawyers are most acceptable to them in market transactions. If the school board's regularly retained lawyer is honest with his clients, he will advance the information himself without losing face with his board. His services usually are in the great many details of another nature than supervising proceedings for bond issues; thus he loses very little income by having the "acceptable" attorneys named at the start. But one thing the school board and superintendent should know and that is the cost of legal opinions. Numerous cases are reported of lawyers' fees running up into extravagant figures above those acceptable specialists. These latter experts usually charge a minimum fee for small issues, but the rate in general above this minimum is about one dollar per thousand dollars of the amount of bonds to be issued.

Where Can Bonds Be Sold?

Usually the best place to borrow money is in the larger money centers of any given state. School boards often do not know this and confine themselves to local commercial bankers who may or may not be proficient in long-term borrowing, which is quite different from short-term commercial borrowing in which these commercial banks usually specialize. In many instances the local banks can absorb or market relatively small issues. In larger issues they may share the business with their correspondent bank in the larger city. Those larger commercial banks in the principal money markets which maintain municipal bond departments may be used by school boards in the first instance. Or the board may go to private investment banking houses or brokers who deal in school bonds.

It is worth the time of the superintendent and school board to consult such financial magazines as *The Bond Buyer*, the *Wall Street Journal*, the *Commercial and Financial Chronicle*, and others and observe the names of the dealers whose advertisements appear there and also to study the type of bonds offered by them. Usually among these advertisements will appear the notices of dealers not far distant from the school district about to do financing. At the same time, by comparison of the numerous issues of securities being offered for sale, the school officials should be able to single out municipalities similar to their own and to ascertain the price at which their securities are being offered for sale at retail.

The next step should be to make specific inquiry of several banks and dealers nearest their own community concerning the particular information they may need in order to give the school board an idea of the necessary proceedings incident to the approaching financing. It is foolhardy for the school board to commit itself to any sort of tentative contract before bringing competition to bear upon its own marketing. Just now, with the Federal Government a great factor in huge borrowings, the prices for borrowing are inordinately low; indeed these costs are only one third to one quarter what they were ten or a dozen years ago. It behooves the school board to obtain lists of bonds comparable to those they plan to issue in order to approximate their own costs.

Planning to Retire Bonds

Then comes the matter of actually planning the bonds after proper preliminary legal advice. The first decision to be made concerns the dates of maturities of the bonds. Shall the board

issue bonds payable on one date at a considerable time in the future, or shall the bonds mature serially over a number of years? Usually the state laws provide that school bonds shall not be outstanding more than a certain number of years. In either case the board should tax at about the same rate to supply the money to pay maturing principal and interest. In the case of the single maturity, the board should accumulate the tax money yearly in a sinking fund against the final date of maturity. In the case of the serial bonds the principal is actually paid in the yearly installments. In both cases the interest for the use of the money is paid semiannually. But in the case of serial bonds there are two important advantages to the school district. As the serial payments are made the debt outstanding and interest on it are actually being reduced, and as this reduction takes place the bonding power already used by the district is rapidly restored for future use. If the school board in planning its serial maturities equalizes them, the average length of time the issue will be outstanding will be about ten years, depending on just how the maturities are placed. Obviously this cuts the cost of doing this business.

In former times of normally higher money markets, it was possible for the school board to obtain liberal interest on accumulations of money deposited in banks. Sometimes this interest would amount to as much as 2 per cent per year. This, when earned on bond sinking funds, materially reduced the cost of issuing long-term single-maturity bonds. Today these opportunities no longer exist. Hence there are few reasons why school boards should avoid issuing serial bonds. Indeed, unprejudiced advice is for boards to avoid long maturities and to elect to issue serial bonds. This means that care should be taken to spread the maturities as evenly as possible over the years between the time of issuance and the state maximum limitation under the law. Also the amounts of bonds to be retired each year should be figured in company with the amounts of interest due each year, and with any other bonds outstanding. Thus the combined debt charges, if properly distributed, will make an even tax load on property owners of the district over the years.

Value of "Call Feature"

During the past few years one of the outstanding characteristics of the investment markets has been the amount of refinancing of the better managed municipalities and corporations. Ten or a dozen years ago it was almost impossible to finance except under penalty of pretty stiff interest rates. It was nothing uncommon for school boards to pay 6 per cent or more for their borrowing, often plus brokers' profits. With the sharp fall in interest rates after the worst of the depression, those organizations which could "call" in their bonds for prepayment before their stipulated maturity date did so and put out new bonds at great savings in interest charges. Such organizations had reserved in their bonds the privilege of thus "calling" them in. This privilege is stipulated in what is known as a "call" or "optional" clause in the bond form of contract. Many school boards did not know about this feature of shrewd financing and issued straight twenty- or thirty-year bonds without option of prior payment. Today interest rates are so inordinately low that any material change in them will undoubtedly be an advance rather than a decline. Therefore, not only is the present an advantageous time to borrow money for new buildings or other purposes, but this optional clause is not so important as in times past. Nevertheless, school-board written policies should include the due consideration of this point on both present and future financing so that future boards may have it called to their attention. The losses incurred by some of the biggest school-district financing because of the absence of this optional privilege have been huge. Today surveys of large city districts, where presumably school boards and superintendents should have known better, disclose large persistent borrowing on as long as thirty-year maturities at rates running up to six per cent, with no revenue whatsoever from accumulations of citizens' tax money in sinking funds.

In order to produce the best competition for the school district's bonds, sometimes it is desirable to consider the wishes of the bigger investment houses in respect to what they will handle in contrast with marketing practices of the smaller dealers. Usually the biggest houses do not care to spend the time to investigate issues whose maturities run less than $5,000 each year. This is due to the fact that large investors and trust funds likewise do not care to be bothered with single $1,000 maturities. Nevertheless the smaller amounts can readily be sold, although possibly at a slightly greater cost. Similarly, the better known communities have a greater popularity with the bigger investors than do the less known districts. Nevertheless, those districts which have kept their credit clean by punctual payments of their debts when due are always in favor. Even the small districts that have established their credits can borrow at not a very great disadvantage compared with the larger communities.

Value of Bonds Shown by Competitive Bids

There are three general methods of selling school bonds to banks or brokers. They are at auction, by sealed-bid sales, and at private sale. The most usual method is to invite sealed bids from a considerable number of dealers. The auction sale is rather difficult to handle because of the numerous different interpretations of bids and the need to analyze them almost impromptu under the pressure of time. The private sale is usually a bad method for the school district and a good one for the brokers. At private sales without competition there usually is greater opportunity to hide the real cost of doing business; whereas at sealed-bid sales there will be sufficient competition to develop the real worth of the district's securities. Time and again one hears of sales of bonds at discrepancies of 5 to 10 per cent of the face value of the bonds between the cost to the school district and what it should have been under competition. Usually these excessive profits to handlers of bonds are hidden in the lump-sum price paid for the whole issue of bonds and in the interest they bear. Today school districts with good credits may borrow money at interest rates of about one half of 1 per cent for bonds maturing in about one year, up to 1¼ or 1½ per cent per year for bonds due in about twenty years. At this date few school boards should issue bonds bearing as much as 2 per cent, although some boards may use slightly more than current interest rates in order to get an additional premium in the price they receive at the time of sale. It must be borne in mind that a higher rate of interest than is necessary continues in force as long as the bonds are outstanding.

Since most states prohibit the sale of bonds below par, districts usually adjust the costs of issuing by being paid a premium above par which, measured with the rate of interest the bonds bear, will equalize the difference between that rate and the going price of money; but included in that figuring will be the bond dealers profit. Under current market conditions that profit may be as high as 1 per cent, but under sharp competition for better known securities, this profit may be reduced to as low as three quarters or possibly even six tenths of 1 per cent.

Pitfalls for Unwary School Boards

There are serious pitfalls for unwary school officials in bond transactions. Board members are constantly thinking of the price that they personally might pay on borrowing in their own business. This is wrong because personal credit is not as high usually as school-district credit, and income from personal loans is not exempt from federal income taxes. Ignorance of money markets is a serious handicap. These rates fluctuate with markets. Usually school officials cannot have better opinion on markets than that expressed in competitive bids for their securities, which of course they can always reject if they so desire. The board must borrow money at the going rate demanded at the time it needs to finance. Sometimes, under circumstances which disturb the markets temporarily, the board may defer action long enough to observe whether changes are temporary or fundamental. However, there are many cases where boards overstayed their opportunity to be financed and lost their markets completely for several years. On the one hand, the board should not be confused by subtle "bearish" talk by brokers who may wish to depress

the board's ideas regarding the credit standing of its own district. On the other hand, the board in dubious situations should seek good but impartial advice from informed people who do not intend to bid for its securities.

Frequently school boards are involved in transactions where some person, possibly in a political clique, "horns into" their business by volunteering, for a fee, to put the board in touch with dealers or lawyers to aid and counsel the school board. *This is not necessary,* and school boards and superintendents are warned against such practices.

School boards that intend to do any considerable financing should purchase one of the little volumes of "bond values" used by all handlers and large investors in securities to translate interest rates into the more practical information of the "yields" from the securities. These yields are based upon the actual purchase price paid for the securities measured into the interest received. A study of these tables can be quite revealing in the light of offers made for the securities.

Also it should be understood that not infrequently bond dealers, in submitting bids, write them in such fashion as to be interpreted in many ways to their own benefit. Thus, for instance, the word "net" may be included in connection with the interest rate the bonds may bear. This may be for the purpose of nosing out some competitor at the time of the bond sale. If there is close competition, the dealer using this wording in his bid might say that this meant that certain expenses, heretofore not mentioned, would be borne by the dealer, thus making his bid more favorable to the school district. If there were no close competition and it looked as if he would be awarded the bonds, no mention would be made of these extras. These additional costs might include such items as the payment for the approving legal opinion, the cost of printing the bonds or for the use of engraved or lithographed blank bond certificates, etc.

Always there is the opportunity for the dealer to make money off the school district through manipulation of "accrued interest." Bonds begin to bear interest from the date printed in the certificate as the date of issue. This comes out of the school districts taxes. But usually there is a lapse of time between the awarding of the contract and the delivery of the bonds due to their preparation. Sometimes bonds are printed and executed long before their sale. Since the coupons calling for this accrued interest are attached to the bonds upon their sale, the interest matured and represented by them has not been earned by the investor because the school district has not had the benefit of the money until the bonds have been paid for. If the school board does not add this amount of accrued interest to the price of the bonds upon delivery, the district loses that much money and the bond dealer profits accordingly. Always the bids for bonds should be subject to the addition for accrued interest.

In the light of the large amount of financing soon to be done by the school boards, it behooves all school officials to take some time off to study their own approaching civic responsibilities.

Modern Performance Standards for School Heating and Ventilating

Philip E. Nelbach[1]

Among the basic human needs which must be met in constructing and operating school buildings are the provisions of a healthful thermal environment and the provision of an atmosphere safe and comfortable for breathing. The two groups of objectives based on these needs are closely related, but they do not constitute a single problem; and in recognition of this fact it would be a step forward if instead of referring to "school heating and ventilating," we adopted the phrase, "thermal and atmospheric conditioning for schools."

Thermal conditioning may be defined as the science and art of securing environmental conditions which permit balanced heat exchange between a person and his surroundings at minimum physiological stress to the individual. The desired conditions are obtained through appropriate adjustment of the air temperature, of the average surface temperature of all surrounding objects (mean radiant temperature), of relative humidity, and of the velocity of linear air movement. These four physical factors singly and in combination govern the rate of heat loss from the human body through convection, radiation, and the evaporation of perspiration.

Atmospheric conditioning involves control of dust and odors, of air-borne bacteria and viruses, of potential chemical hazards such as toxic gases, vapors and fumes, and of air temperature and absolute humidity which affect the state of the nasal and respiratory mucosa.

Over the past years we have fallen into the habit of thinking too soon in terms of mechanical equipment and structural details, skipping too quickly over consideration of the physiological needs of the future occupants. School building codes have mentioned figures of required air temperature and air change but not much more. Now is an opportune time for us to appraise the problems of thermal and atmospheric conditioning for schools from the right direction, namely, to begin with an analysis of the underlying physiological principles. All attempts to approach from the other end, through taking inventory of the equipment and devices available and the results they can accomplish, are inevitably shackled by the mistakes of the past, by outdated research which was the basis for the original designs and patents of much of our contemporary equipment.

[1]The author, who is assistant professor of public Health at Yale University School of Medicine, was recently active as assistant to Dr. C. E. A. Winslow in the comprehensive survey of schoolhouse heating and ventilation for the New York State Department of Education. The study, which covered the public schools of the Empire State, is at the time of the present writing in the hands of the New York State Board of Regents for adoption.

Thermal Environmental and Physiological Factors

A thermal environment should be provided in all areas of activity throughout the school building which will at all times of occupancy permit adequate heat loss and prevent excessive heat loss from the human body.

Metabolic heat, produced in the process of metabolism going on at all times in all the living cells of the body, must be liberated continuously for sustained comfort, the rate of heat loss necessary varying principally with the age and weight of the person and the degree of physical activity. A normally clothed adult of medium size seated at desk work should lose about 400 BTU per hour. The following figures may be taken as representing the desirable heat loss for average-sized children of the ages indicated seated at desks in a classroom.

Age (Years)	Average heat loss (BTU per hour)
7	200
10	250
13	300
16	350

Accelerated physical activity ranging up to violent athletics may increase this desirable rate of heat loss as much as tenfold; so that optimum thermal environments will vary in different spaces of the school building with the activities to be performed.

It is readily apparent from our individual experience that there is a range of environmental thermal conditions in which we are comfortable. This range of conditions is termed the "comfort zone," and in this zone the body accomplishes liberation of heat by different

methods. Toward the cooler portion of the zone physiological regulation is accomplished by slight changes in the distribution of blood carrying heat from the inner organs and tissues to the skin, resulting in slight changes of the skin surface temperature, and hence, in the rate of heat dissipation by the radiation and convection to the environment. Secretion of perspiration is at a minimum, and the heat loss from a clothed body, in the absence of drafts, approximates the following distribution:

Method of heat loss	Per cent of total loss
Radiation to surrounding walls and surfaces	40
Convection to surrounding air	30
Evaporation of perspiration and loss from respiratory tract	25
Contact and miscellaneous	5
	100

This condition may be taken as typical of students sitting in a classroom during the heating season with the room so heated that the average of air temperature and mean radiant temperature is between 70 and 72 degrees Fahrenheit.

Of course, with increased physical activity this relative distribution changes radically, with a much larger proportion of heat being liberated through evaporation of perspiration. The relative proportions change also as the heat exchange permitted by the environment varies. Thus, a person exposed to the direct rays of the sun will gain much more heat by radiation than he loses by radiation, and convection and evaporative heat loss must be increased for comfort. A person exposed to rapidly moving cold air may lose so much heat by convection, evaporative heat loss remaining at the minimum stated above, that heat must be gained by radiation rather than lost to produce continued comfort.

It should be noted that relative humidity plays a very minor role in thermal comfort at customary indoor winter air temperatures, a change of 25 per cent relative humidity being the equivalent of only a single degree Fahrenheit change in air temperature.

A second point that should be appreciated is the fact that perspiration heat loss represents the cooling effect of the change in state from liquid water on the skin and mucosa to water vapor, and hence causes no increase in the temperature of surrounding air and surfaces. We may, accordingly, divide the figures of metabolic heat loss for children of different ages, tabulated earlier, into two components: sensible heat loss and latent heat loss. The former is that fraction which adds heat to the surrounding environment and which must be considered in the design of heating and cooling facilities.

Age (years)	Average heat loss (BTU per hour) Sensible heat	Latent heat	Total heat
7	150	50	200
10	188	62	250
13	225	75	300
16	262	88	350

In the hotter region of the comfort zone physiological regulation is accomplished through dilation of the capillaries near the body surface, allowing more blood and heat to flow into the skin, thus raising skin temperature to maintain if possible the original total heat loss through radiation and convection. If this heat liberation is insufficient, the sweat glands are stimulated, and cooling through evaporation of perspiration from the skin and through the clothes becomes the major method of physical heat loss to the environment. This picture of thermal regulation may be taken as typical for students in the classroom environment during the warm or nonheating season months of the year. In the heating season conditions in all parts of the school where sedentary activity is the rule should never enter the hotter region of the comfort zone where the major share of heat loss must be accomplished through evaporation of perspiration.

Standards for Thermal Conditioning

A. During the Heating Season

In the past it has been customary to state standards in terms of air temperatures alone or perhaps effective temperatures. However, it is now realized that the *operative temperature* (the arithmetic average of air temperature and mean radiant temperature) supplies a better description of conditions bearing on thermal comfort during the heating season.

1. Recommended temperatures for the heating season:

Type of space	Design operative temperature[2] (°Fahrenheit)	Corresponding room air temp.[3] (°Fahrenheit)
a) Sedentary activity as for example in classrooms, auditoriums, offices, cafeterias	70°	68°–72°[4]
b) Moderate activity as for example in corridors, stairways, shops, laboratories, kitchens	68°	66°–70°[5]
c) Vigorous activity as for example in gymnasiums	65°	60°–70°[5]
d) Special cases, lockers, and shower rooms	78°	76°–80°[5]
Swimming pool area	83°	80°–86°[5]

2. The air temperature differential or gradient from floor to five feet above the floor should not exceed 5 degrees, and preferably should not exceed 3 degrees (Fahrenheit).

3. Air movement in zones of occupancy should not exceed 25 linear feet per minute, so-called "still air." (Operative temperature standards must be increased 1 degree F. for each 10 linear feet increase up to 55 feet per minute.)

4. Relative humidity is unimportant as a thermal factor during the heating season.

B. During the Nonheating Season

Comfort may be furthered under hot conditions by reducing the temperature or humidity of the air or both, but the equipment necessary for this purpose is complex and costly. However, air conditioning for auditoriums and other closely occupied spaces should be given serious consideration where extensive use of such spaces during the hot season appears to indicate such facilities are needed, and for classrooms also in regions having very hot and humid summer climates.

1. *Air Temperature and Relative Humidity*

Where reliance is placed on air cooling the maintenance of an indoor temperature not above 75° would be ideally desirable; but too sharp a contrast between indoor and outdoor conditions should be avoided. At 80° outdoors, indoor temperature should not go below 75° at 90° outdoors, indoor temperature should not go below 78°; at 93° outdoors, indoor temperature should not go below 80°.

If artificial dehumidification is indicated, the Comfort Chart of Effective Temperatures (American Society of Heating & Ventilating Engineers) indicates the desirable limits.

2. *Air Movement*

In cases where air cooling or dehumidification is not justified, increase of air movement may be utilized for cooling. The effect of air movement varies as the square of velocity. Air at a temperature of 80.5° with 400 feet per minute of air velocity and air at 78° with 100 feet per minute of air velocity have the same cooling effect as air at 70° with 16 feet per minute of air velocity.

Through building orientation and provision of adequate window or louver openings advantage should be taken of prevailing summer winds. Quiet electric fans may be installed.

A velocity of at least 100 linear feet per minute of turbulent air movement should be assured when needed.

3. *Mean Radiant Temperature*

The students should be shaded from direct solar radiation, and the structure and insulation of the building should be such as to keep inside surface temperatures as low as possible.

Atmospheric Factors

The air throughout the school building should at all times be safe

[2]The operative temperature represents the mean effect of the temperature of the air of a room and of its walls. Under normal conditions walls and air exert approximately equal effects; but if a room has three cold exterior walls a higher air temperature will be necessary for comfort than in the case of a room with a single exterior wall exposed to the sun but not to the prevailing winds.

[3]The lower figure for air temperature in each case is for a room with relatively warm walls; the second figure, for a room with relatively cold walls.

[4]30 in. above floor.

[5]60 in. above floor.

and comfortable for breathing. Safe air implies freedom from agents in the atmosphere known to have injurious effects when breathed by humans.

Bacteria and viruses are now known to be carried in visible state considerable distances in slow-moving masses of air and in the streams moving through ventilating ducts. Air disinfection is a new, busy, and rapidly moving field of research.

A great deal of work has been done investigating the effects of odors upon health. It is now known that objectionable odors have a deleterious effect on appetite even when the subject's sense of smell has been dulled through continued exposure to the stimulus to the point where he no longer consciously recognizes its presence. Normal body odors may be kept below significant levels by dilution with fresh air at the rate of 10 cubic feet of fresh air per minute per occupant.

Certain dusts and pollens excite allergical manifestations in a significant proportion of the general population.

Gases such as carbon monoxide, hydrogen sulfide and nitrogen dioxide, vapors such as benzol and toluene, fumes such as lead, zinc and cadmium oxides, metallic dusts from lead, mercury and cadmium compounds are all typical poisons, recognized and understood by public health workers in the field of industrial hygiene, which may find their way into the school environment from outside or be produced inside in the laboratories, shops or heating plant.

Air temperature has an effect on the tonus of the capillaries in the nasal mucosa. High temperatures dilate these blood vessels, causing the mucosa to become swollen, turgid, and spongy; so that over the turbinate bones in the nasal passages it occludes the air channels. On going outdoors into cold, chilling air, the capillaries constrict, cutting off fresh blood supply to the swollen mucosa and presumably leave it in a more vulnerable condition for attack by pathogenic organisms normally resident on the mucosa but usually successfully repelled. If overheating is avoided, this hazard does not exist.

Absolute humidity, or water vapor pressure in the air, governs the degree of dryness of the nasal and buccal mucosa. Progressive drying of these surfaces occurs at vapor pressures below that coincident with 45% relative humidity at 70° dry bulb air temperature, but whether there are any health implications no one has yet demonstrated. People often complain about "dry" or "scummy" throats, but usually this effect is due to high air temperature, to dust, or to an oncoming upper respiratory infection. Whether important or not, little can be done about it, since raising the relative humidity is difficult and expensive, and unless high quality double or triple-glazed sash and tightly sealed wall insulation are used, excessive dew and frost formation will take place on interior surfaces during cold weather.

Ions or charged molecules of the gases in air, or the presence of small amounts of ozone are both considered as having no influence on either health or comfort.

Standards for Atmospheric Conditioning

1. *Bacteria and Viruses*

No standards can as yet be formulated. When research in this field has progressed farther, however, definite recommendations can be drafted. The dissemination of bacteria and viruses should always be controlled at the source as far as possible by excluding persons who are ill from school and through observing the rules of personal hygiene.

2. *Odors*

Odors should be controlled, wherever possible, by elimination at the source. For the dilution of those odors which are unavoidably present in the air of classrooms and other occupied spaces, an air change of approximately 10 cubic feet per minute per person should be provided under normal conditions of weather and schoolroom occupancy.

There is no need to recommend specific standards of minimum volumes for classrooms, auditoriums, etc., based on heating and ventilating factors. These volumes are better established by other demands, namely: room function, furniture location, and by natural and artificial illumination and acoustical considerations. With adequate ventilating facilities producing uniform distribution of fresh air, room volume itself is not of significance.

3. *Dusts*

No quantitative standards are at present available. Dusts of all kinds should be controlled so far as possible at the source.

4. *Chemical Hazards*

Toxic substances, gases, vapors, fumes and dusts, in dangerous concentrations should be absent at all times from the atmosphere in all school spaces.

5. *Air Temperature and Absolute Humidity*

In accordance with present knowledge, good thermal conditioning will automatically assure adequate treatment of these variables.

Obviously, the field of thermal control and atmospheric regulation is one of complications. Great advances have been made in the past decade, but there are gaps in our knowledge, probably some of which will remain for later years to reveal. Continued research must certainly be stimulated.

Local boards of education, architects, engineers, and builders who design and construct school facilities, teaching and operating personnel; and the state departments of education are all in partnership to provide environments conducive to healthful living for all school children. The more successful the co-ordination among these parties, the better will be the results attained in meeting the needs of the children and other members of the communities which these schools serve.

There is a lag in achieving through architectural and engineering techniques the goals established by governing physiological principles. Another loss occurs too often in lack of imagination and interest on the part of operating staffs and supervising personnel and in lack of understanding of the facilities provided.

Greater stress should be placed upon the proper training of school principals and custodians in matters pertaining to maintenance and supervision of heating and ventilating equipment, and more attention given to providing adequate funds for their effective operation.

By unity of aim and freedom of approach, the school personnel, and the architects and engineers can arrive most effectively at their common goal.

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For Better Physical Education —

Planning the School Gymnasium

*Arthur R. Winters**

I

Postwar plans for gymnasium construction now exist in various stages of development. Some plans await release of critical materials, some need government approval, some require a vote on a bond issue to provide the necessary building funds, some are still preliminary sketches in the architect's office, while others are still uncrystallized ideas. At whatever stage these plans may be, the administrator, the building committee, and the teachers who will use these facilities, should all be concerned with the functional design of such a unit and with the materials which will form the unit. It should be a matter of business for these several individuals to become familiar with the various materials which are suitable for the purposes for which the building is planned. While the architect is properly charged with the design and mechanical perfection of the building, its over-all plan and utilization in terms of educational needs is a responsibility of the administration. We might well enlarge our community of interest, as Katherine Glover says, "A schoolhouse should never be built in a vacuum of public ignorance — it should be a thrilling adventure, rousing the interests of all of its citizens."[1]

This interest does not demand an engineering education but suggests the need for some knowledge of best and common practices or of recommendations based on acceptance tests. To cover the field of practices and materials for gymnasiums alone is a large order and the presentation here of guideposts for materials and practices is far from complete. Each building is a problem unto itself, defying standardization. Its construction will reflect the educational philosopy and policies guiding the physical-education program (including athletic competition), which prevail in that particular school district.

This discussion is only concerned with the design and construction of the gymnasium proper and not with the auxiliary or service units, such as locker room and showers. The following elements, pertinent to the construction of a well-integrated unit, will be considered: type of unit, location and size, floor, bleachers, walls, windows and lighting, and ceiling.

II. Unit Types

Various individuals, associated in some capacity with school buildings, have sought to type gymnasium structures by categories. Even a cursory examination of gymnasium units over a period of years would reveal the difficulty of attempting to classify such units. One individual would limit such structures to three types, namely: game gymnasiums, apparatus gymnasiums, and the double playroom in which a removable partition separates the boys' unit from the girls'. Another person notes a broader range of structures, running the gamut from one-room schools where exercises are attempted in the aisles, through the stages of playrooms, gymstage, and auditorium-gym combinations to the well-defined independent unit for gymnasium purposes only. Such categories lend little aid to the confused planner as they point toward the pitfalls of standardization rather than toward the recognition of each structure as an individual and distinct problem. The trend in recent construction warrants some observations concerning the type of facilities erected.

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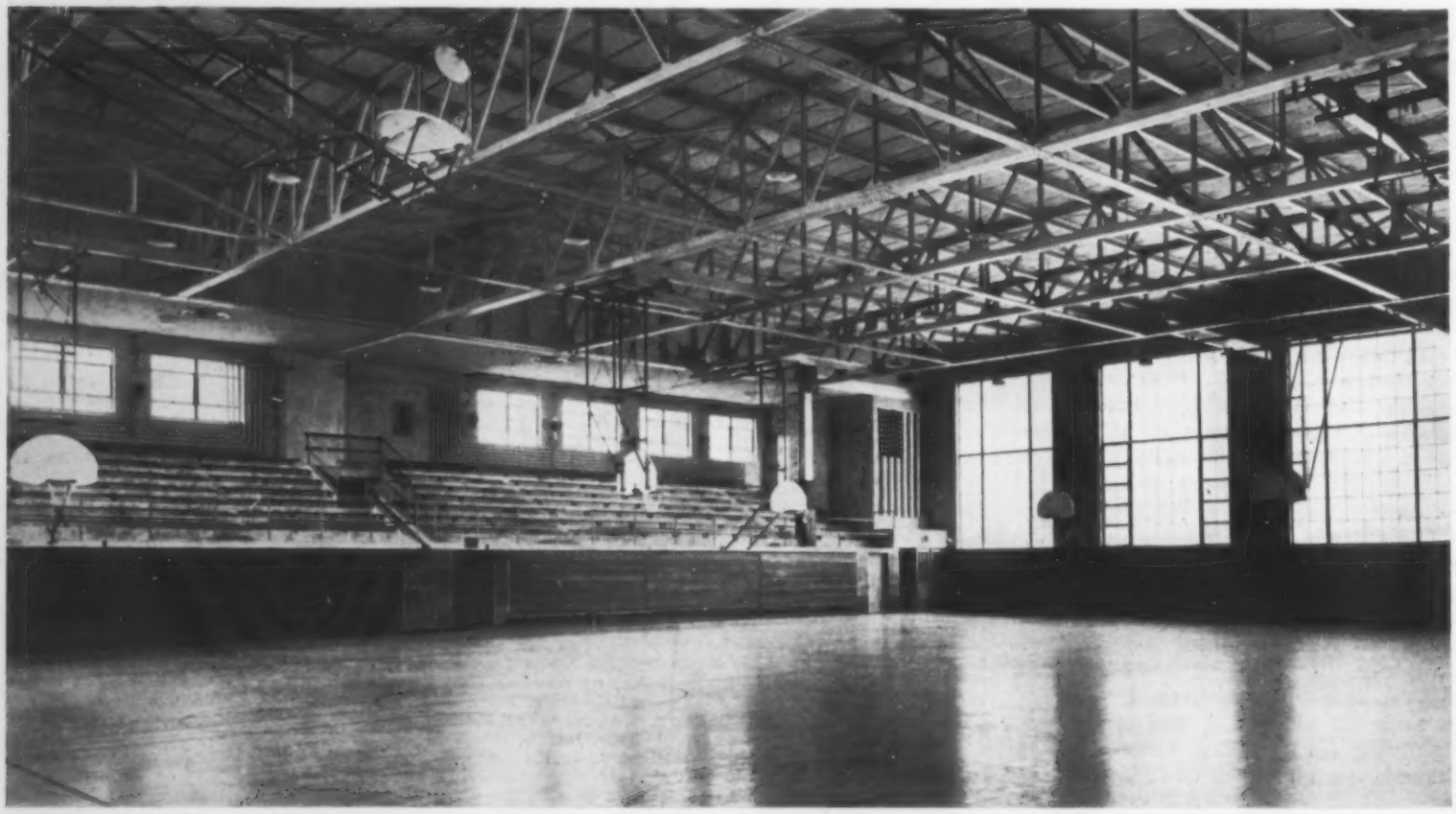
[1]School Board Journal, Vol. 110, No. 1, p. 44.



The gymnasium of the John W. Sexton High School, Lansing, Michigan, is planned for multiple use by double classes. The permanent bleachers are supplemented with folding back bleachers.

The exterior of the Gymnasium, Phoenix Union High School, Phoenix, Arizona, has been treated to keep the building in harmony with the scale and general design of the modernistic high school plant.

Our immediate interest centers in the merits and shortcomings of the basic styles of construction; it is not concerned with makeshift or temporary structures. The two types which demand our attention are (1) the gymnasium for gymnasium purposes and (2) the combination of the gymnasium with an auditorium or stage. The building committee is often confronted with making a choice between these two, and unfortunately the decision is frequently arrived at without due consideration of many factors which will influence the final form of the proposed unit. Repeatedly the choice is resolved on the plea of economy, a plea which may overshadow the best educational practice and choke desirable educational outcomes, as well as ignore the long-term economy which measures deterioration and maintenance.

In order to provide some form of gymnasium, with limited financial resources, the building committee seeks a solution by effecting plans for a combination with some other unit of the school plant. Granting that a partial unit is better than none at all, the amount appropriated for this structure would be to represent a considerable savings to warrant the construction of a combination unit in preference to an individual unit. It is the writer's contention that the most desirable and sound solution rests in planning and constructing the gymnasium as an integral unit unto itself. This position is supported by responsible persons who have studied the relative merits of various types.

Alice Barrows, former Specialist in School Building Problems in the U. S. Office of Education, deplores the building of combination units in these words,

> I have never known a school superintendent or principal who did not agree that a combined auditorium and gymnasium is unsatisfactory for use either as an auditorium or as a gymnasium.[2]

Dr. N. L. Engelhardt, well-known educational consultant, in discussing the probable impact of the war on school-building planning and on gymnasiums in particular, foresees the trend in these words,

> The schools will tackle earnestly this job of building sound men and women as it never has in the past. . . . Inadequate and insufficient recreational and body-building facilities will not be countenanced. Gymnasiums, note the plural, will be parts of the school plant. They will not be merely innertubes of auditoriums but will be planned for an all-day evening service in body-building.[3]

Conflicts in Multi-Use Rooms

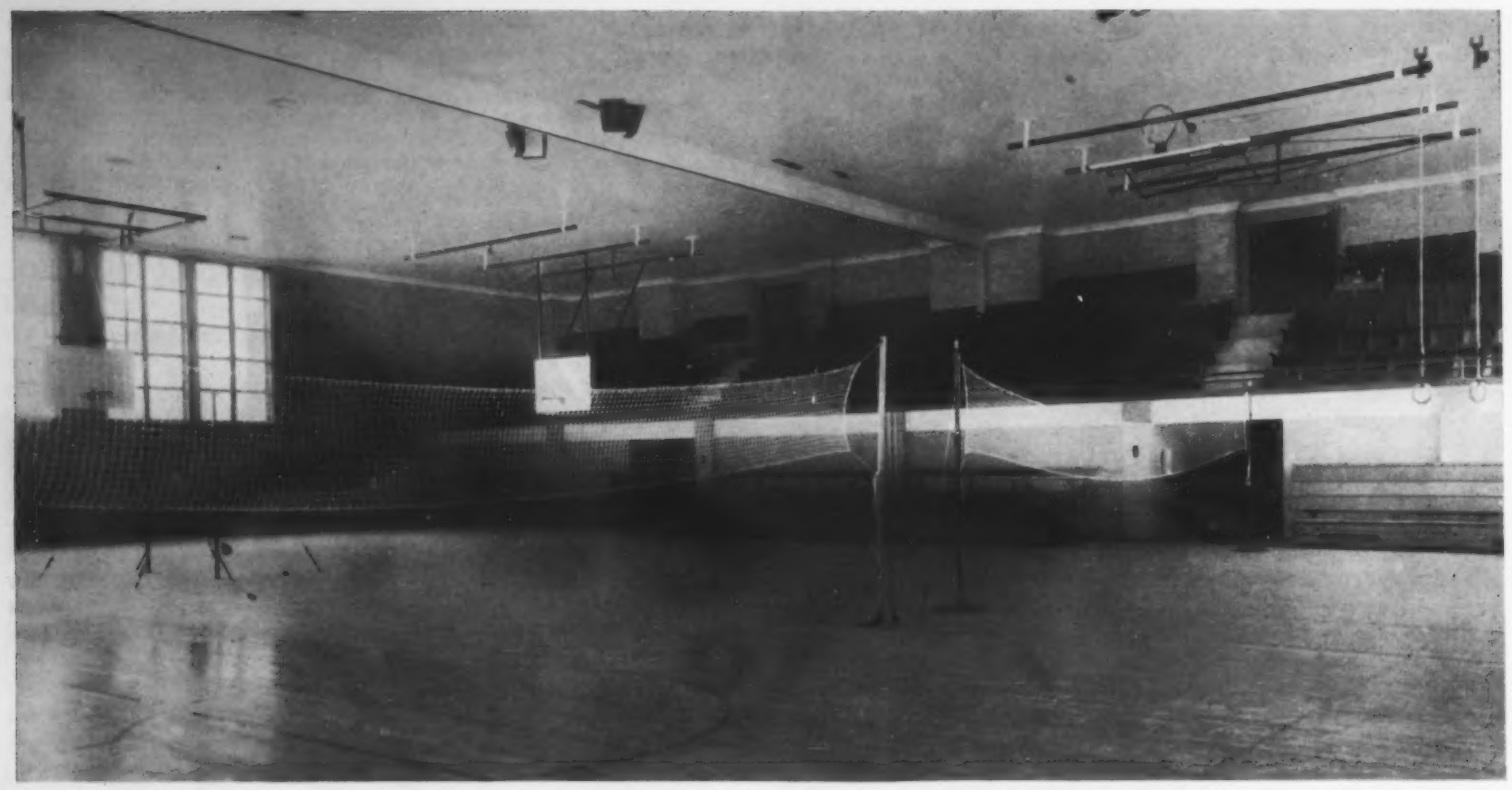
It is well to examine some of the points which differentiate these two types of facilities and make their roles distinct, also what makes them suitable for one function and impractical for another. Uppermost is the problem of usage, and the approach to this question is to note some of the conflicts in usage which appear with the advent of combination units. For example; the dramatic department wants to use the stage for practice during the sixth period physical-education class; or the members of the debating team need to orient themselves to the auditorium, but basketball practice is underway; or the girls' gym class at the seventh period has to be called off because the orchestra must rehearse in front of the stage. And so it goes. This request for special usage is denied, or this need is unfilled, or some club must curtail its plans, resulting in disappointed students and strained faculty relations.

Another disadvantage of the combination unit is evident where the gymnasium floor serves as the seating area for student assemblies. The chairs needed not only have an initial cost and subsequent repairs and replacements, but the handling of them for each assembly is quite an expense. If a full schedule of classes is assigned to this unit, the placing of chairs must interfere with a normal class session. Also, the use of chairs on the floor adds to the maintenance problem; not only do the chairs themselves mark the floor but the shoes of the occupants leave their marks. The element of safety is another factor to be considered. The

[2]"The Combined Auditorium-Gymnasium," The American School and University, 1938 Annual, p. 291.

[3]"The Impact of War Upon School-Building Planning," The American School and University, 1942 Annual, p. 14.

A satisfactory type of demountable partitions in the Appleton High School, Appleton, Wisconsin.



The gymnasium in the Will Rogers High School, Tulsa, Oklahoma, has an acoustical ceiling and both permanent and folding back bleachers.

combination unit increases hazards rather than reduces them. The stage and projections therefrom are usually too close to the playing area. Elevated playing floors, such as a stage, are also hazardous. The fragile appointments required for stage or auditorium may be easily damaged by a normal activity program. Unprotected windows, curtains, stage props, and acoustical materials cannot avoid being hit by balls. The durable wall surface demanded of a gymnasium is not compatible with the requirements of a good auditorium. Furthermore, when the need arises to meet overflow conditions, such as additional study-hall space, the over-taxed auditorium-gymnasium will be the unit designated to accommodate this group.

When these very real and disturbing elements are carefully considered the case for the construction of combination units is not strong. Avoidance of these difficulties lies in the independent gymnasium unit.

III. Location and Size

The location of the gymnasium will conform to the general plans for the entire school plant. Wise planning will locate the gymnasium unit so that it is easily accessible and has its own outside entrance. While the unit does not need to be detached from the main building, it is desirable to establish the gymnasium as a wing, preferably with the main floor at ground level. This arrangement permits the use of this unit without opening the entire school building, and at the same time localizing the noise usually present. The amount of ground available, the topography of the site, and relationship to athletic fields are other factors, beyond pure economy, which will influence the probable location.

One of the most difficult questions to be met by planners is the problem of size. How large should the floor be? There is no formula which will satisfactorily provide the answer. In arriving at a final decision as to size, a survey, of the local situation, based on the following questions, should be undertaken and the facts submitted by the administration:

What is to be the nature of the program in which the pupils will engage?
Will these activities require a large or small amount of space?
What will be the total enrollment?
How many periods per week will physical education be required of each student?
How many teaching periods per day will be available? for boys? for girls?
What will be the range of the size of the classes?
What size crowds must be accommodated at basketball games?
Will boys and girls use the same or separate gymnasiums?

In short, what are the needs of your particular school with respect to physical education? It is infinitely better to determine a size to fit the needs than it is to make educational practice conform to a miniature gymnasium.

A hypothetical situation will serve to illustrate our problem. In a school of 350 pupils physical education is required 5 days per week. As there are 7 periods in the daily schedule each class will average 50 pupils. Many authorities consider a class of this size as maximum. If our program is well balanced with conditioning exercises, combatives, relays, apparatus, and games, we will want a minimum size floor of 60 feet by 80 feet.

IV. The Gymnasium Floor

The choice of materials and method of construction used in gymnasium floors show less deviation from what is considered "best practice" than most any other essential element of gymnasium construction. To be sure, innovations in both materials and methods have been introduced, but the continued selection of hard-maple flooring indicates that past experience in the use of this type of flooring has been quite satisfactory. As yet the ideal flooring has not been produced, no one kind is free from objections.

Hand in hand with material selection is the parallel factor of method of construction. Good materials may not produce expected service or satisfaction if the design or the method for laying the floor is faulty. In a gymnasium floor the characteristics most desired are resiliency, smoothness, comfortableness, durability, ability to resist marking or scarring, and easy cleaning. Both materials and manner of construction contribute toward the realization of these qualities.

Before expanding on the use of wood flooring let us note other materials that are being used for this purpose.

Tests will reveal that there is little if any difference in the resilient qualities of various floor materials when these tests are made only with respect to the materials themselves. This is only a partial picture — it does not take into account the materials and

type of construction that make up the subfloor. Therein may be the answer as to why one type of flooring is more comfortable than another.

Whereas concrete has served as the flooring for playrooms, it is considered by itself to be too uncomfortable and too dirty for gymnasium purposes. Linoleum can be attractive, and aids noise reduction, but its durability over a period of time is not comparable with other materials. Asphalt tile is now being used in colors, with lines and sections of courts designed with an inlaid effect. While making a good appearance, the permanency of the lines reduces flexibility of changing any court markings. While less resilient than linoleum it is also subject to indentations and markings from apparatus, and if laid directly on a concrete base it loses some of its resiliency. Mastic, rubber tile, and plastic tile are other materials offered for gymnasium flooring. Their comparative newness suggests that care be exercised to check the physical properties and other characteristics of these items before selecting one of them for this particular purpose.

Wood blocks or blocks-on-end have proved satisfactory flooring in a number of schools. While long on durability, players do not find them as comfortable as maple-flooring construction. Although not the smoothest surface wood blocks offer a nonskid quality. Wooden blocks seem to be more sensitive to moisture permeating underneath than other types of wood floors, with serious buckling resulting. It should be added that seepage through faulty wall construction is usually the forerunner in such situations. Minor changes in humidity and temperature are normally controlled by expansion joints. The usual method of construction is to lay strips of these blocks on a pliable mastic base over a concrete subfloor.

Laying and Finishing Floors

Whereas birch, beech, oak, and maple have served well as gymnasium flooring, the consistent service of hard-maple flooring has made it the favorite. Better mill selection and preparation of maple flooring has resulted in a better product for the customer. And supporting this improvement has been the development of wood fillers and sealers as well as finishes. Furthermore, improved methods in floor maintenance have aided in producing a better playing surface. The grading of maple flooring provides the customer with desirable information as to quality and cost. Costs will vary with thickness and width of cuts as well as with quality. Thickness should be considered if much resanding and refinishing are anticipated in the maintenance program. Widths preferred for gymnasium floors lie between 1½ inches and 2½ inches. Lengths are usually assorted at the factory.

The method of constructing maple gymnasium floors is more or less standardized. It consists of a reinforced concrete base upon which sleepers or screeds are laid 16 inches apart and are either fastened to or embedded in the concrete. On top of these sleepers a hard pine subfloor is laid at a diagonal. Then on top of this is laid tar paper, or felt, or some other type of insulating material. And finally the selected grade of wood flooring is laid.

It is perhaps elemental to point out the necessity of (1) allowing sufficient time for the drying out of the concrete, (2) using thoroughly dried lumber in both the top and subflooring, (3) avoiding the danger from the presence of moisture while the floor is being laid. In this respect there are certain precautions which should be observed to prevent buckling, cracks, and cupping. To this end the Maple Flooring Manufacturers offer these definite suggestions:

1. Don't lay flooring immediately after delivery; allow absorbed moisture to evaporate.
2. Don't lay flooring until the building in which it is to be used is dry.
3. Don't lay flooring until plastering and cement work are thoroughly dried and woodwork and trim installed.
4. Don't lay flooring in cold, damp building.[4] (70 degree temperature is recommended.)

Furthermore, this group believes, "the laying and finishing of hardwood floors should be the last operation in connection with the construction of the building."

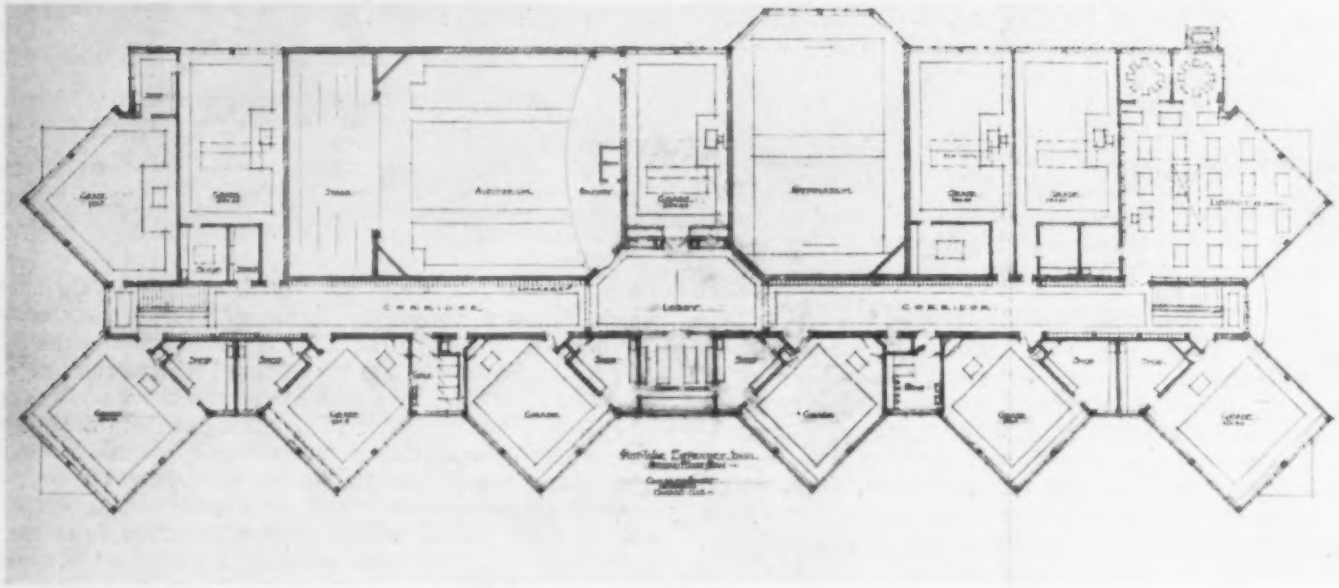
This means that after the top floor is laid care should be exercised about permitting traffic or liquids to discolor the original surface before the floor is sanded and sealed. Several good seals and finishes are on the market, and their application should be supervised by a trained representative of the manufacturer. It is definitely better to choose a seal and finish especially designed for gymnasium use rather than to permit contractors to substitute ordinary floor finishes or varnishes that are unsuited to quick stopping, rubber burns, or marks from equipment. Not only are these special finishes more satisfactory from the standpoint of initial application; they are also more suitable to ease of maintenance and successive treatments. It has been demonstrated that some seals are quite satisfactory as a floor finish without the addition of a varnish, and the traffic will provide the polish. On such a floor rubber burns from gym shoes have been easily removed by cleaning with a treated dust mop. It should be expected that the character of the rubber in gym shoes today will leave more marks than formerly, thus placing an added burden on maintenance. Another advantage in using an especially designed finish is found in the property of such a finish to be used for dancing and then quickly to permit restoration to its condition as a playing surface.

(To be concluded in February)

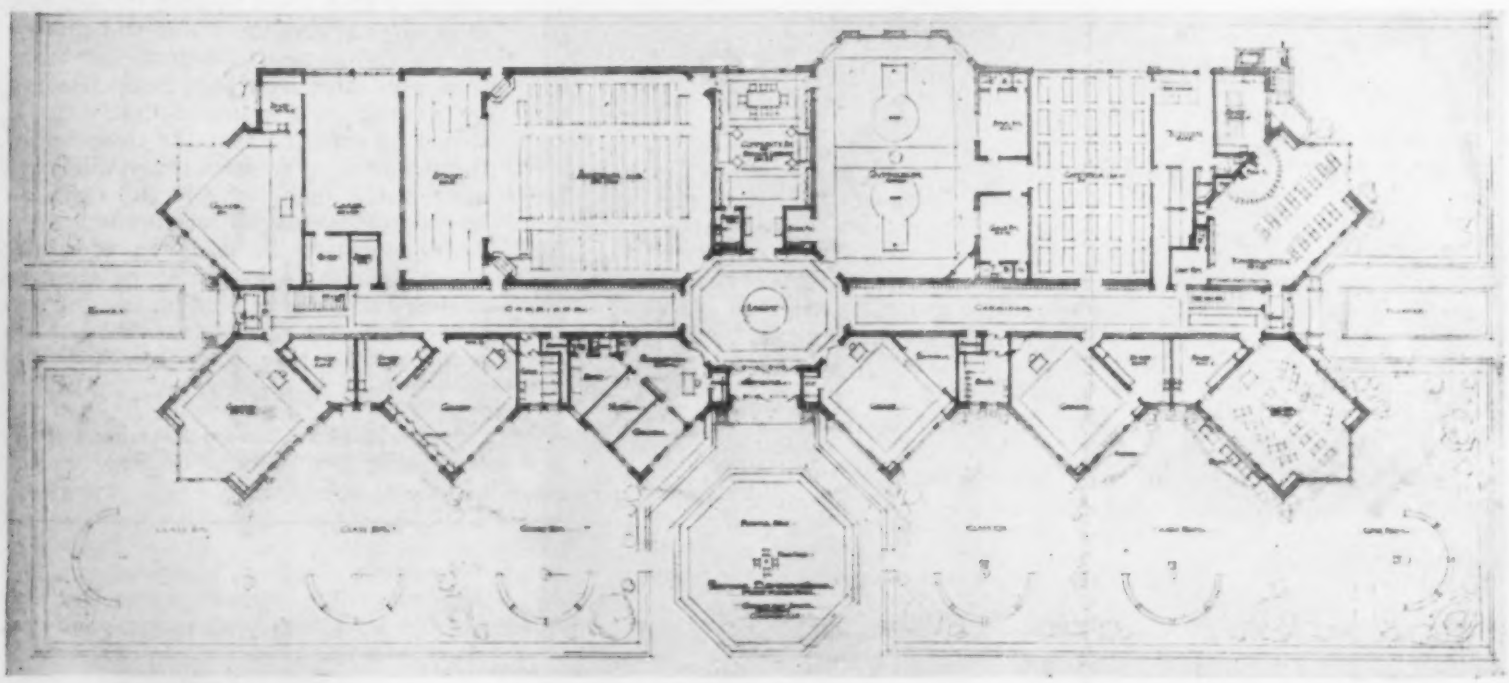
[4] "Grading Rules and Standard Specifications," Maple Flooring Manufacturers Association, Chicago, Ill., 1935.

Permanent folding bleachers in the Appleton High School gymnasium are pushed back into wall recesses leaving the entire floor free for physical education activities.

Rear View of the Postwar School Model. — Childs & Smith, Architects, Chicago, Illinois.



Second Floor Plan of Postwar School Plan.



Main Floor Plan of Postwar School Plan.

Exterior View of the Model of the Postwar School. — Childs & Smith, Architects, Chicago, Illinois.

An Architect's View of the Postwar School

O. H. Breidert[1]

The postwar school building will be planned from the inside out. Functional architecture with a minimum of adornment will supplant our monumental school design which set up fixed standards over a long period, stifling the growth and leading to quick obsolescence. While impermanence in exterior appearance is not to be desired, our future schools will be constructed simply — mass, color, and texture will make for character and beauty. New materials of construction and improved methods of insulation render the former waste of noninstructional spaces of attic and basement unnecessary, except in special instances where unusual conditions must be met or desirable architectural effects are sought.

All school buildings should be inviting to children, with a maximum of light and sunshine, bringing nature into the room itself. Carefully landscaped and well-kept school grounds are an asset and not a liability to any residential community. Flowers and foliage create a pleasant approach. Well-equipped playgrounds denote activity and physical stability. It would seem that our elementary schools, at least, should present a more playful aspect, eliminating the stern and hard exterior evidenced in much modern design. A varied perimeter, better proportioned windows, and the omission of high parapet walls play a great part in producing such a "youthful" appearance, compatible with the happy outlook of young children.

Primary schools require larger instructional rooms than formerly. Kindergartens 30 by 30 ft., or 30 by 40 ft., are a fair size. Future schools are providing auxiliary kindergarten rooms, 18 or 20 by 30 ft., for special groups. Sunny locations, with south and east exposures, are preferable. A commodious work space, a coatroom, storage space, and toilets for kindergartens are minimum requirements. Window seats, a fireplace, and an aquarium are added features well worth the money.

Standard elementary classrooms today measure 24 by 32 ft. (with a work area, 8 or 10 ft. wide) or 24 by 40 ft., without a workshop. Some instructors prefer that all activities shall be conducted in one room, and that supply and storage cases be recessed in the walls. Ten lineal feet of storage case, 26 in. deep, fitted with adjustable shelves, teachers' files, coat and hat space seem adequate. Additional built-in case work may be supplied to satisfy changing subject-matter and teacher requirements. More display boards and less blackboards will brighten the postwar school building. Finish in natural birch and light oak, combined with walls and ceilings in two or more cheerful colors, will prevail.

The possibility of lighting every grade room from two sides is an intriguing improvement and would produce the same livable qualities found in a corner room in the home. Bilateral windows have lost much professional opposition in view of newer informal arrangement of classroom furniture which has replaced the old regimented type fixed to the floor.

Plastics, plywood, noncorrosive metals, glass blocks, acoustile, new resilient floor materials,

(Concluded on page 60)

Aerial View, roof removed, of Model Postwar School Building. — Childs & Smith, Architects, Chicago, Illinois.

[1]Architect with the firm of Childs and Smith, Architects, Chicago, Ill.

School Floors in Wintertime

David E. Smalley[1]

As in most other phases of everyday living, the winter brings special problems to floor maintenance, both in methods and materials Because of the slush carried in from snowy sidewalks, floors are subjected to more severe usage in the winter, and there is the increased hazard of slipping. All of which calls for extra consideration in the matter of treating and maintaining floors in the wintertime.

The first of these problems is the condition of the materials to be used, for some of them are affected by cold weather.

If, for instance, a liquid floor wax of the solvent type (the kind you buff to produce a polish) is used the danger of damage from freezing is avoided, but there is still the annoyance of congealing. Congealed wax, or even wax that is partly congealed, cannot be spread satisfactorily and will result in a streaked floor that is more or less susceptible to slipperiness.

It is entirely safe to ship the solvent waxes even in the coldest of weather. They will be solidified when received, but storage in a warm room for several hours will soften them so they can be whipped into usable consistency by rapid agitation. This is easiest done by inserting a broom handle in the large opening of the drum, the edges of the opening providing the ideal fulcrum for stirring leverage.

A solvent wax must not, however, be overheated, such as storing it next to a radiator. Overheating causes it to separate.

If necessary to apply a solvent wax in a cold room the user sometimes has trouble from the wax congealing as it touches the floor. This condition can be remedied by first mopping the floor with hot water. If the water is hot enough it will dry almost as fast as it is spread over the floor, and another workman can follow fairly closely with the wax, applying it before the floor becomes chilled again. This method is particularly effective in the treatment of hard surface floors, such as terrazzo, concrete, etc.

Congealing of solvent waxes can also be overcome in cold rooms by setting the wax pail in a larger one containing hot water. This plan may be used successfully in connection with that of warming the floor.

Freezing Harms Water-Emulsion Waxes

If the self-polishing (water emulsion) type of waxes is used, there will be less trouble from congealing but more from freezing. Because the vehicle of all self-polishing waxes is water, all of them are subject to freezing. And all of them are ruined by hard, prolonged freezing. Brief or partial freezing does not always spoil them, and therefore when a frozen shipment arrives it should be so noted on the carrier's receipt and the material accepted by the consignee.

When it thaws out, withdraw a little and see if it dries with a gloss. If it does, it is uninjured. If it dries dull with a grainy surface, it is ruined and unfit for use. The supplier should be notified at once and if he is reliable he will exchange it for fresh material, though it may be necessary to wait for the replacement for favorable weather.

In the terminology of the wax manufacturer self-polishing waxes so spoiled are "set up." They become thick because the emulsion has reversed itself and there is, as yet, no remedy for it. It is a complete loss to the manufacturer, though he usually wants the material back. Most manufacturers have a stock of "setup" wax laid aside in the hope that the laboratory will eventually find a way to salvage it.

Improperly made wax emulsions may "set up" without apparent cause, and sometimes the condition develops through careless polluting of the supply by the user. This latter condition is often the result of pouring back into the main container the leavings from the application pail. Applicators dipped into the material, applied to the floor and returned to the material introduce germs into the latter, setting up a bacterial decomposition. The safest method is to pour the emulsion on to the floor and spread it with the applicator.

Freezing, however, is nowadays the most common cause for breakdowns of the emulsion waxes, and this is what happens: When in proper condition the emulsion is composed of tiny particles of wax surrounded by a film of emulsifier. Originally this emulsifier was soap, but improved emulsifiers have long since superseded the soap, providing more stable and more waterproof emulsions.

Because the particles of wax, which are insoluble in water, are held apart by the water-tolerant film of the emulsifier, they remain permanently in suspension. And because these particles are so very small they reflect the light uniformly when spread out over a flat, nonporous surface, providing a gloss.

However, when something causes the emulsion to disintegrate, either bacteria, the introduction of acid or freezing, the water breaks through the film that has held the wax particles apart, and because of their natural affinity for each other the particles combine. Then the emulsion is reversed with the water inside the wax, resulting in a more or less gelatinous mass. And because the combined particles when spread over a surface are now too large to reflect the light uniformly as before, they present a dull, graining appearance. Only by buffing — by reducing the particles through friction — can they be made to show a gloss.

These facts about waxes should be helpful information to users at any time, but they are especially pertinent in cold weather when wax emulsions are more likely to present a problem.

Water Spotting and Slippery Conditions

Other problems which are more common and pronounced in the winter are water spotting and slipperiness. Any floor wax is likely to water spot and be slippery before it is entirely dry. Especially is this true of the self-polishing emulsions, some of which are slower in drying than others. Those which dry slower may seem quite dry to the touch, but they retain their original moisture longer than the others. Even though slow drying may seem to be a handicap, it is an indication of a superior product. As in the case of sealers, slow drying permits self-leveling, promotes greater toughness of the film and, by allowing greater penetration, increases the adhesion to the floor. The slower drying products are likely to wear longer.

In cold, damp weather the drying time of any coating is prolonged. Heat drives off moisture, but heat in a closed room is not very effective in this regard. If the confined air itself is already laden with moisture, it will be slow about absorbing more.

The remedy in such cases lies in buffing. Unless the wax film is inherently water soluble (as some are) the heat caused by the friction of buffing will drive off the residual moisture. This means that more than just a job of polishing must be done. A good gloss may be produced without creating sufficient heat to thoroughly dry the film. To ascertain if the wax film is dry, a little water should be poured on it. If it turns white, buff it again. Prolonged buffing in one spot creates heat, so the polishing machine should be moved over the surface very slowly. By this method more can be done in an hour or so than might take place in a day or two of normal drying time.

Before applying a second coat of wax emulsion, the first coat should be entirely dry. Otherwise the second coat may cut into and disturb the first, resulting in a dull, streaked finish. This is another wintertime problem which can be solved by buffing the first coat or by waiting several hours before applying the second coat. As indicated above, a little water poured on the film will always reveal the presence of residual moisture.

The hazards of slipping are naturally increased in the winter, regardless of precautions in the matter of floor maintenance. Ice or caked snow on heels and soles create a slippery condition on any surface. Therefore, if children or teachers have falls, the floor finish should not be blamed too quickly. The victim would probably have fallen on an untreated floor. Care can and should be taken, however, to minimize the danger as much as possible by providing door mats at entrances and by keeping adjacent walks and steps clean.

The proper maintenance of wintertime floors is not more difficult than in other seasons, but it does call for a little difference in technique and perhaps for a little more

(Concluded on page 82)

[1]Floor Specialist, Brazil, Ind.

The Auditorium for the Small High School

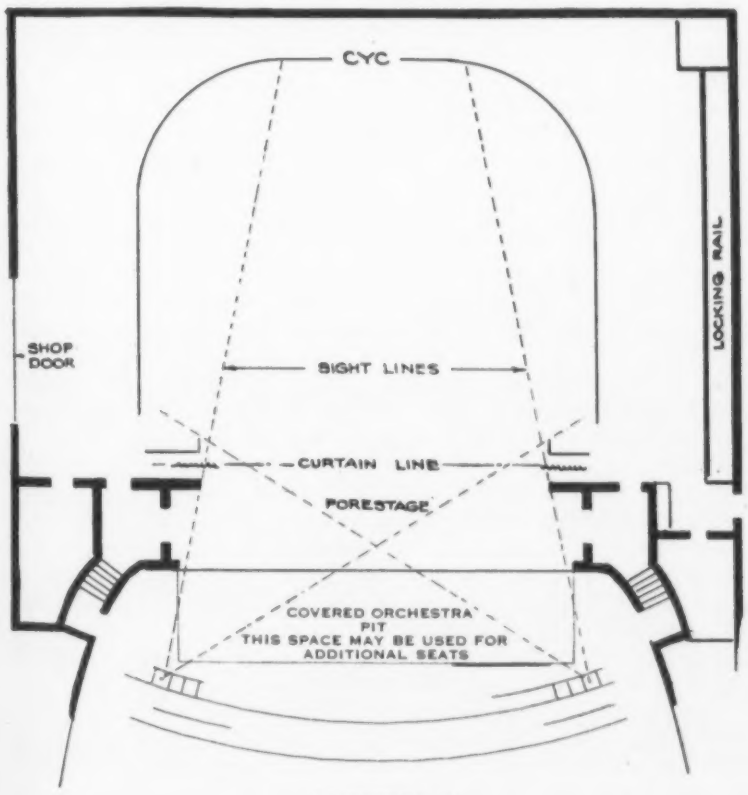
A. S. Gillette[1]

A comparison can be drawn between a well-planned auditorium and a pair of comfortable shoes. If the auditorium is well planned one is hardly conscious of it all and one's interest can be completely absorbed by the presentation on stage. But let there be something wrong with it, and like shoes that pinch or chafe, it is practically impossible to give one's attention to anything other than the source of irritation. This fact is obvious enough to any individual who has found himself a member of an audience in some make-shift auditorium or assembly hall where for the better part of an evening he has perched upon some hard, squeaky seat and has been forced to crane first to one side and then the other in an effort to secure even a partial view of the stage. Or the truthfulness of this fact can be verified by those who have been unfortunate enough to find themselves situated under a balcony or in some other acoustical pocket in an auditorium where they can hear only a part of what is being said on stage.

All too frequently the two cardinal requirements of being able to hear from every part of the auditorium have been either ignored or overlooked in a desire to build an impressive auditorium with a great capacity or because it was thought necessary to save funds by utilizing the same area for such diversified activities as dramatics and athletics.

The latter of these two faults is the more serious since auditoriums with a large capacity can be so designed and have been constructed with every seat providing equally good sight lines to the stage and from which the occupant can hear with ease. The problem here is one of recognizing the demands of both sight lines and acoustics and of adjusting the plan of the auditorium to these needs. While these demands are exacting and may require the services of a specialist in order to meet them, there is the comforting thought of knowing that a perfectly functioning auditorium is possible.

[1]Department of Speech, State University of Iowa, Iowa City.



Layout of typical stage for school auditoriums. (Cut by courtesy of National Thespian Society.)

Disadvantages of Combination Rooms

No such assurance can be held for the success of the combined auditorium-gymnasium plan. It is rather appalling how frequently this same type of mistake has occurred in the construction of otherwise well-planned high school plants. Yet at the same time it is quite understandable why variations of this fault continue to persist. In most high schools of average size the auditorium and the gymnasium would be comparable as to general size and shape. The cubage of one is about equal that of the other. What then is more logical than to use the same area for both athletics and assemblies, especially since each make only part-time demands upon the same space? To an architect who has been charged with keeping the building costs within certain limits and to the committee responsible for the expenditure of funds, the utilization of a single room for various activities seems both an economical and perfectly logical solution.

The advantages of such a combination that look so well upon paper and sound so well in theory fail to materialize when put into practice. The fruit of such a union is inevitably measured in terms of friction, confusion, and wasted man hours rather than in worthwhile accomplishments. Perhaps this paper in pointing out some of the objections of such a merger will help discourage the continued practice of building high-school auditoriums and gymnasiums with built-in limitations that can do nothing but shackle the activities that are housed within them.

The majority of high school administrators and principals will agree that the combination of gymnasium and assemby hall is unfortunate, but if one wants to get really firsthand information as to why this scheme is doomed to failure, he should discuss this problem with the director of dramatics and assemblies and with the athletic director—those two poor harassed individuals who must share the same laboratory. There are just too many points where dramatics and athletics are diametrically opposed to expect them to share the same quarters without conflict.

Two Solutions Considered

The so-called solution to this architectural conundrum usually takes one of two forms, one being considerably worse than the other. The lesser of these two evils converts the gymnasium floor into an auditorium with an elevated stage at one end or the other of the basketball court. The other proposes to transform the gymnasium into the stage by appending an auditorium to one of its sides and, of course, using the same auditorium for audiences, assemblies, and basketball crowds.

An analysis of these two make-shift arrangements makes it rather apparent that from the viewpoint of either director or coach there is little in the way of physical equipment which has not suffered because of such a condition. Consider for a moment some of the objections to the first of these two plans; the gymnasium that is converted into an auditorium. There is the problem of setting up and arranging the chairs which may range from 100 to more than 500. This is an item of no mean consideration in itself since it involves additional janitor service and the time required for this operation must be deducted from the use of the gym for any other purpose. An equally serious objection is found in the almost prohibitively bad sight lines from auditorium seats arranged on a flat or level floor. Such an arrangement automatically insures a restless audience for two reasons. In the first place temporary auditorium seats in order to be light enough to handle easily and to be stored in a compact space, must be of the folding variety which practically eliminates the possibility of any great amount of comfort being an inherent part of their design. The second reason is obvious enough to anyone who has ever sat as a member of an audience in such an auditorium. This audience is characterized by constant movement as each spectator tries to catch a glimpse of the stage by leaning from one side or the other or by sliding his chair into a position from where he may see past those who are seated in front of him.

Problems of Illumination and Ventilation

Another point where the gymnasium and the auditorium differ radically concerns the matter of both illumination and ventilation. The gym is characterized by plenty of large windows so that fresh air

and daylight may be utilized to the best advantage, while the ideal theater auditorium has no windows of any kind and depends upon a ventilating system for fresh air. Planning to cover the gym windows with shutters or with curtains to keep out the light has not proved successful as there is inevitable enough spill light past the window blinds to ruin the effectiveness of many stage lighting plans.

There exists another objection to this gymnasium-auditorium combination that has been ignored too long. There is an unmistakable odor associated with a gymnasium that proves to be anything but an asset when the same room must be used to house an audience that has gathered for a musical recital or a dramatic performance. There appears to be no solution for this difficulty except separate quarters for each.

The problem of attempting to use the stage for rehearsal purposes of any kind while the other end of the gym is being used for athletic drills or practice is so clearly out of question that no elaboration of this topic is necessary here. It will, however, serve to point out how impossible the second of these two make-shift arrangements must be when the entire gym floor is expected to become the stage. This scheme does possess one questionable advantage over the other plan in that when the gym is being used for one activity it cannot possibly be used for anything else at the same time.

The Stage Gymnasium

This second plan, with the auditorium attached to one side of the gymnasium-stage may possess all the necessary accommodations for an audience and in many respects it may prove quite satisfactory. As an auditorium it may have ample capacity, comfortable permanent seats, a sloping floor, an orchestra pit, good sight lines and good acoustics, and still fail because it was forced into a union with a structure to which it is totally unrelated. An auditorium and a stage cannot be considered separately, they are each an integral part of a single unit. The size and shape of one is dependent upon the other and the sooner this fact is recognized the sooner our educational system will rid itself of inadequately planned auditoriums and stages.

The major fault of this second plan does not lie with the auditorium but with the stage area. There seems to be a common misunderstanding of just what a stage is, what is expected of it and how it is to be used. Unfortunately the idea seems pretty well established that any elevation at one end of an auditorium which can be enclosed by a curtain will serve as a stage. Nothing could be farther from the truth. The stage must be considered as a machine, with highly specialized equipment designed to meet specific needs and without them the stage is as handicapped as a chemistry laboratory without benefits of running water, gas, or electricity. A partial list of the essential stage equipment would include the following:

Some Stage Requirements

A specially constructed floor of soft wood, equipped with removable sections called traps and fitted with steel covered floor pockets for electrical outlets

The major part of the stage floor to be covered with padding and covered with a heavy canvas floor cloth

Sufficient unobstructed height above the stage to insure adequate "fly" space with a properly designed gridiron from which units of scenery can be suspended

A counterweight system with an adequate number of battens properly spaced

A U-shaped sky cyclorama which may be raised and lowered by means of the counterweight system

An adjustable light bridge, or one or two counterweighted battens devoted exclusively to lighting equipment

Adequate space on either side of the proscenium arch for the storage of properties and scenery

An act curtain, separating the auditorium and stage which may be operated by pulling from side to side or by raising and lowering

A special set of masking units by which the width and height of the proscenium arch may be varied

The forestage, an extension of the stage floor into the auditorium beyond the curtain line, should have depth of 6 to 8 ft., with passageways connecting it with the backstage areas.

To alter a gymnasium to accommodate this partial list of stage equipment would ruin it and to build a stage without properly equipping it is to handicap it so badly that little can be done with it. Why not recognize that these two plants; these two laboratories, call them what you will, are so basically different in plan and purpose that they cannot be combined without impairing the usefulness of both.

Plan for Flexible Use

In speaking of the auditorium and stage there has been no effort made to advance the cause of dramatics beyond the needs of other activities that can be housed harmoniously with it. By so equipping the stage it is made more flexible and the better able to meet the requirements of presentations other than plays. With a minimum of time and effort a stage so equipped can be adapted to the needs of general assemblies, rallies, music and dance recitals, concerts, lectures, motion pictures, debates, public discussions, and to a host of other functions demanding space for an audience and a stage for those who are to perform.

With both careful and original planning there is no reason why the auditorium and stage of the small high school cannot serve the many needs of the school and be used for the needs of the community as well. A combination auditorium, assembly and study hall is not beyond the bounds of reason. This may require something new in auditorium seat design and in seating arrangements, but up to the present time there has been little demand to stimulate original thinking along this line. Finding a satisfactory design for a comfortable auditorium seat with a tip-up or disappearing desk top attached to the seat in front and with adequate spacing between seat rows to permit easy access is simple in comparison to finding a solution to all of the problems presented by the stage-gym combination.

The Auditorium Plan

Actually the planning of an auditorium is governed by surprisingly few requirements and once these are recognized, with due allowances made for them, there is little chance that any major fault will result. Reduced to its lowest common denominator the auditorium is a large room where an audience may gather and be comfortably seated from where they may both see and hear what is being presented on stage. The design of the more successful modern auditoriums has generally taken one of two forms; either that of a rectangle or of a wedge. In both cases considerable care has been taken with the seating arrangement to avoid having the seat rows extend any great distance beyond the width of the proscenium arch. This simple precaution eliminates whole blocs of seats that would otherwise provide very poor sight lines to the stage. There has been a tendency in some of the newer high schools to make the proscenium arch much too wide. In some extreme cases it is as wide as the length of the entire basketball court. It is well to remember that the average width of the professional stages in New York City is but 32 ft. to 34 ft. The auditorium with a floor that slopes gradually toward the stage helps tremendously in placing the seats so that spectators may see over the shoulders or past the heads of those seated in front of them. The conventional orchestra pit, or an alternate scheme providing space for an orchestra, should be given serious consideration since any auditorium that must serve varied activities will make exacting demands upon it. The ease and speed with which an audience can enter and leave an auditorium is dependent upon the number of corridor entrances and by the aisle and seating arrangement. One of the most satisfactory plans permits the audience to enter from a series of entrances located in either side wall from corridors paralleling the length of the auditorium. Plenty of space between rows of seats allows the audience traffic to move across the width of the auditorium rather than up or down its length.

The topics which have been summarized in the preceding paragraph have been treated in detail by the same author in a pamphlet called *Planning and Equipping the Educational Theatre*. Copies of this publication may be had for the price of printing (60c) by writing to the offices of the National Thespian Society, College Hill Station, Cincinnati 24, Ohio.

Placer Union High School Plans Swimming Pool

Harold E. Chastain, District Superintendent
and Ernest E. Weihe, Architect

THE SUPERINTENDENT'S ACCOUNT

The experience of the Placer Union High School and College in inaugurating and planning a swimming-pool project may be of assistance to other school districts who face a similar postwar building program. Placer's problem was characterized by: complete inexperience of the board or staff with swimming pool planning or construction; lack of a regular school architect; utilization of as many staff members as possible in the planning process; provision for a functional plan that is adapted to the local needs and existing plant; and, a survey of over fifty near-by swimming pools for the purpose of selecting an experienced and successful architect, and to obtain ideas concerning both good and bad features of pools in operation.

After the board of school trustees had authorized the program it was necessary to determine procedures of investigation and planning. A survey of the literature in the field brought forth several helpful references, among which the most useful was the study by Frederick W. Luehring.[1] Luehring's criteria for judging standards and his extensive bibliography were of uncommon value at this point in the planning.

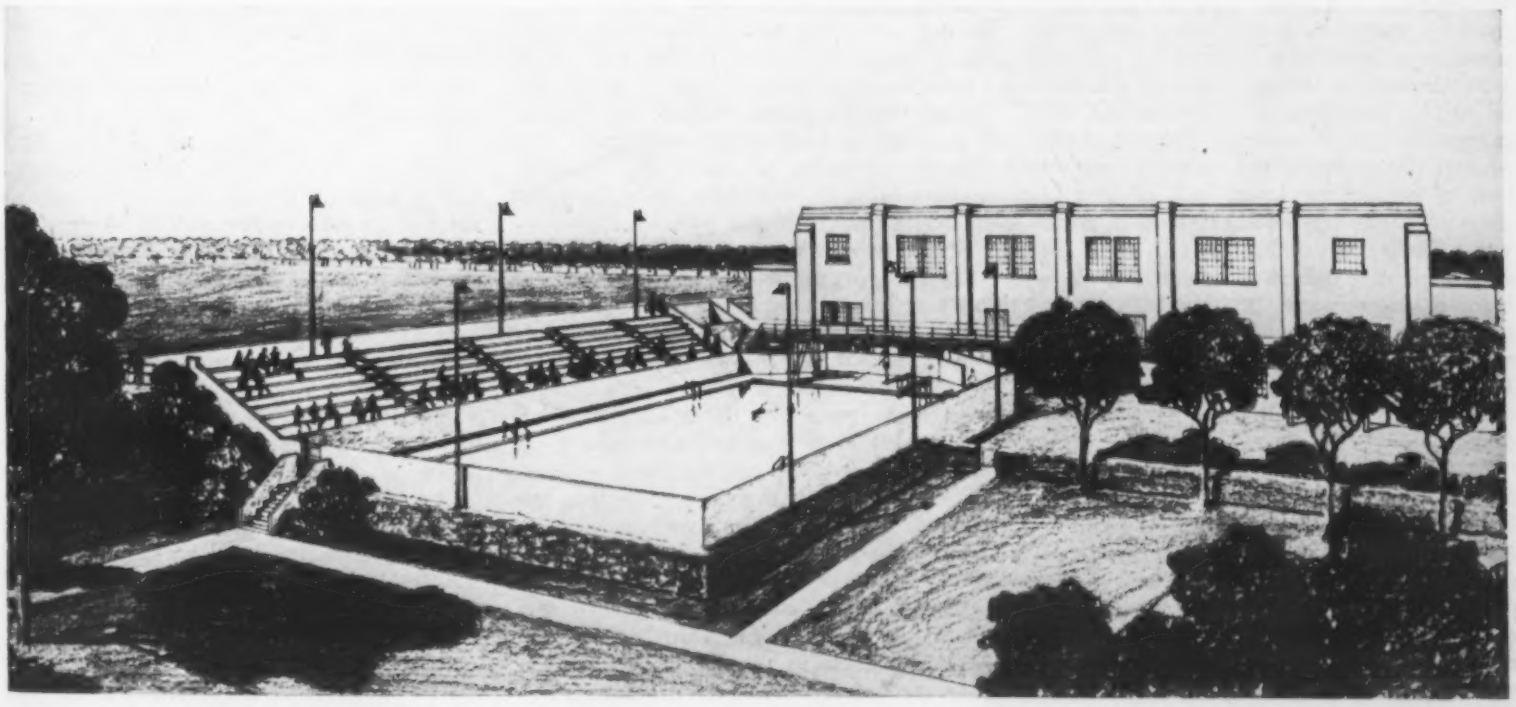
A committee of five administrators met and outlined an agenda of procedure which included: use of the policy of determining structure on the basis of the educational needs of the largest numbers; provision for the appointment of a permanent planning committee composed of members of the physical education and health departments, the maintenance staff, and general administration, which should meet and consider details of placement, educational specifications, maintenance specifications, and health considerations; provision for obtaining the advice of engineers, public-health officials, public-education construction officials, legal advisers, and architectural technicians; provision for a survey of school and public swimming pools in Central California with names and addresses of successful architects, evaluations of pools now in existence, with a list of common errors to be avoided, and cost figures on construction and operation; a survey of physical-education objectives and needs with corresponding facilities and equipment recommended to meet them.

With approval of the board the district superintendent appointed the planning committee mentioned above, which met a number of times, giving consideration to the following questions: location, size, indoor or outdoor, single or multiple tanks, a nonswimmers or waders area, water heated or cold, depth, provision for spectators, accessories, runways, shower and foot baths, poolroom (if indoors), purification, utilization of used water for irrigation, covering materials, acoustical and aesthetic values, functional placement of component parts, recreational (summer) use, and health and safety features.

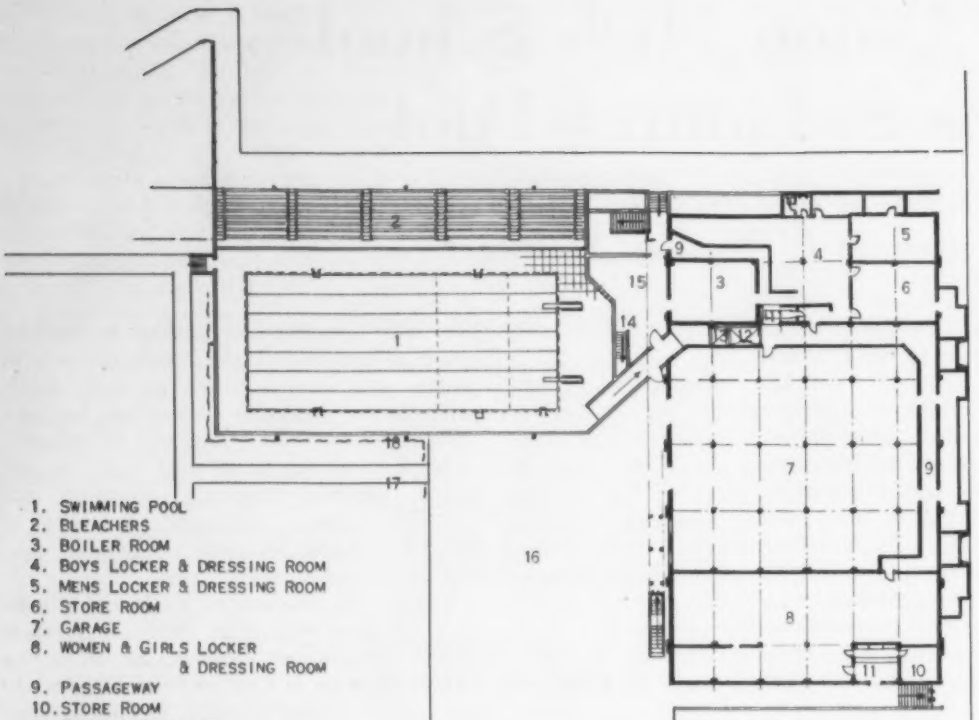
During the summer of 1943, the district superintendent visited 23 public and school swimming pools and approximately 30 private swimming pools in Central California for the purpose of finding possible architects, engineers, equipment manufacturing firms, current procedure in the construction and operation of pools, defects found by operators in the construction of pools, costs, and similar information. The writer strongly recommends this procedure when coupled with other sources of information.

In discussing successful operation of various pools with the actual operators, there was a general consensus of opinion that unnecessary mistakes of many types were made in the drawing of the plans by the architects and the construction by contractors. The first 12 public pools visited were each built by different architects and contractors, and each one

[1] Luehring, Frederick W., *Swimming Pool Standards* (New York: A. S. Barnes & Co., 1939), 273 pp.



General view of Swimming Pool and Locker Room Building, Placer Union High School, Auburn, California. — Weihe, Frick & Kruse, Architects, San Francisco.



Main plan of Swimming Pool, Placer Union High School, Auburn, California. — Weihe, Frick & Kruse, Architects, San Francisco, California.

contained unnecessary mistakes in design and structure from the operators' standpoint. Operators unanimously agreed that swimming-pool construction involves a specialized type of designing and engineering and should be done by specialists in that field. Among the more common defects reported by operators were: leakage of the tank; lack of durability of paints; placement of entrances and exits preventing proper control; slippery decks; area of diving depths not adequate; narrowness of competitive lanes; lack of adequate slope of decks for drainage; lack of underwater lights; proximity of tall vegetation making cleaning difficult; inadequacy of dressing and locker rooms; problems of temperature, acoustics, and humidity in closed pools; square corners preventing adequate cleaning; lawn and unsurfaced areas not separated from decks by fences or walls; and narrowness of decks.

As a result of the above survey, the board of trustees engaged the services of Mr. Ernest E. Weihe of San Francisco as their architect. Mr. Weihe, after giving consideration to all subsequent planning, submitted preliminary plans and sketches, which were examined in detail by the board and the planning committee. On the basis of function, some seventeen recommendations for changes were made, all of which were readily accepted by the architect and incorporated into the final plans.

An example of the type of functional change in design or additions to the structure is illustrated by one suggestion which came out of discussions of the planning committee. It was recommended that an aluminum or light metal bulkhead be designed which could be placed in and across the pool at the shallow end, which would be bolted to the end, which would telescope outward so as to provide for the shortening and lengthening of the competitive swimming lanes which would make possible the swimming of nearly any distances, whether in yards or meters, with the finish exactly at the end of the pool.

At the present writing the Placer pool has not yet been constructed, although plans and specifications are completed.

The Placer Board of School Trustees is convinced, that, by the techniques and procedures used above, they have been able to learn enough concerning the building of swimming pools and their operation to assist them materially in co-ordinating the details of planning with the educational program that the structure is to serve. They are, furthermore, of the opinion that by the utilization of a large number of staff members, they have brought about a consciousness and understanding of the problem which will be extremely valuable in the future. A complete mimeographed account of the development of the project is available without cost to school boards or administrators.

THE ARCHITECT'S ACCOUNT

Finding an architectural solution for the swimming pool problem of the Placer Union High School and College at Auburn, Calif., was presented for study in the summer of 1943. The school board had delegated the district superintendent to make an exhaustive study of neighboring pools and to formulate a program stating the requirements and the desiderata.

The major considerations determined by him and translated into architectural terms were:

1. The normal school use of the pool during school terms
2. Public use of the pool during summer months and on special occasions throughout the year
3. Army use of the pool for training purposes — a use intended to supersede other requirements during the war
4. Normal use of school dressing rooms and showers by students
5. Alternate use of school dressing rooms and showers by public or by army personnel
6. Access by public and students to bleachers or viewing stand and dressing rooms from various directions
7. Separation of bathers from clothed public at all times
8. One central control for male and female bathers and interposition of showers and foot bath between dressing rooms and pool

A gymnasium building, with gymnasium and special exercising rooms on the first floor (level along the south and east sides with an upper street) and with boys and girls locker and dressing rooms and showers on a basement floor (level along the north side with a large paved and planted area) already existed and generally fulfilled the school requirements. The location of this building in relation to other school buildings, the peculiarities of the terrain and consideration of other future construction offered a very interesting, if somewhat complicated, problem.

The preliminary discussions of the problem included reports of an existing planning committee, visits to the site with the superintendent and the school board and the study of the existing functions. Available also were the services of the California State Division of Schoolhouse Planning.

It had been predetermined by the school board that the pool be an open-air pool. This met with the hearty approval of the architect, whose strong personal preference for reasons too numerous to state here were for open-air pools.

The solution of the problem as stated above is best explained by the accompanying plan and perspective drawing.

An existing balcony along the north side of the gymnasium building at the first-floor level was extended toward the west and connected to the ground with a stairway. This gave access to the bleachers by passing over the pool walls, for spectators approaching from the western part of the school grounds. It also

(Concluded on page 82)

Master Lists and Storage of Equipment Used in High School Courses in Science

*Clarence Wilson Greene, Ph.D.**

The comprehensive survey, on which this article is based, was made in response to inquiries received from public school representatives who were anticipating development programs in relation to the increase of their facilities for science courses. It was our hope, also, that the results of the survey would make a contribution to the national movement to improve the conditions for science instruction in a large number of the smaller American high schools in which adequate science equipment has not been provided.

Sources of Information

The sources of information from which the lists of items of apparatus, chemicals, and other laboratory materials were compiled include (1) lists of science equipment required by some State Departments of Education, (2) lists of science equipment recommended by several State Departments of Education, (3) lists of equipment recommended for use in conjunction with the science textbooks and laboratory manuals that have been most widely used in American high schools, (4) the Ohio State University Research Monograph on "Lists of Essential Apparatus for Use in High School Sciences" by Holy and Sutton, (5) the equipment lists prepared by one of the largest American manufacturers of science apparatus for use with selected high school laboratory manuals, (6) results of a questionnaire sent by the writer to a representative group of high-school teachers of chemistry.

In order to insure having up-to-date information contributions from only recent editions of high school texts and laboratory manuals were utilized.

From the merged lists obtained from the various sources, a master list of equipment for each of the four science fields (chemistry, physics, biology, and general science) was compiled.

In order to provide a sound basis for suggestions on the storage of equipment, the following essential information was determined:

1. The dimensions of each item of equipment by consulting equipment catalogs or through actual measurements made
2. The maximum number of each item appearing on any of the lists
3. The total drawer area, cupboard area, and shelf area required for the proper storage of the entire list of items
4. The height of shelf spaces and the total length of shelf spaces required for the storage of all the equipment listed
5. The required "line" storage for such items as are most efficiently so stored

A. Equipment Lists and Suggested Plans for Storage for High School Chemistry

In this article the discussion will be limited to the field of high school chemistry. The results of the survey were analyzed and organized for laboratory class groups of the following sizes:

1. Twenty students to 24 students, inclusive
2. Thirteen students to 19 students, inclusive
3. Twelve students or fewer. Group 3 is for the small high schools in which the supply of equipment usually would be the most limited.

In general the maximum laboratory class enrollment for which the lists of equipment were compiled was **24** students. Some lists were compiled for **10** students, some for **12** students, and some for **15** students. However, the primary reason for limiting to **24** students the maximum size of a section, for which the lists of equipment are organized, is that the author is thoroughly convinced, through personal experience and through discussions with successful science teachers, that the efficiency of the laboratory work decreases seriously with any increase above that number.

This conclusion is verified by a "School Opinion Poll" recently obtained through questionnaires mailed to 500 representative school administrators.[1] The vote of the superintendents on the optimum size of science classes was given as follows:

Pupils	Per cent
25	37
20	35
30	13
15	8
35	3
10	2
Over 40 pupils	1

The complete list of equipment has been segregated in three groups: (1) equipment to be kept in the student's desk; (2) stock room equipment, including chemicals, battery materials, glassware and other materials; (3) apparatus to be kept in apparatus storage cases.

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The following is the list of equipment recommended for storage in each individual student's table:

A. Usually Kept in Drawer

2	4-oz. alcohol lamps, if gas is not available
1	Pyrex beaker with lip, 100 c.c.
1	Pyrex beaker with lip, 200 c.c.
1	Pyrex beaker with lip, 250 c.c.
1	Pyrex beaker with lip, 400 c.c.
1	Blow pipe, brass, 10 in.
2	Bottles, wide mouth, 8 oz.
1	Calcium chloride tube
1	Clamp, Mohr's pinchcock
1	Crucible, Coors' porcelain, No. 0
1	Crucible cover, Coors' porcelain, No. 0
2	Evaporating dishes, Coors' porcelain, capacity 70 c.c., No. 00A
1	File, 5" or 6"
1	Package of filter paper, 11 cm. dia.
1	Flask, flat bottom, Pyrex, 250 c.c.
1	Flask, flat bottom, Pyrex, 500 c.c.
1	Steel forceps
1	Funnel, glass, 2½ inch dia.
1	Funnel, tube, thistle top, 30 cm.
2	Glass plates
1	Graduate, cylindrical, 100 c.c. x 1 c.c.
1	Box of labels, gummed, No. 203
1	Box of litmus paper
1	Medicine dropper
2	Rubber stoppers to fit Pyrex test tubes, 1 hole
1	Rubber stopper to fit 8-oz. bottle, 2 holes
1	Rubber stopper to fit 16-oz. flask, 2 holes
1	Package of 500 splints
1	Stirring rod, 10" long, ¼" dia.
1	Test tube, brush, double radial tip
2	Test tubes, Pyrex, 2 cm. x 15 cm.
1	Test tube, Pyrex, without rim, for ignition, 15 cm. x 1.8 cm.
6	Test tubes, soft glass, well annealed, 6" x ¾"
1	Test tube rack, for six tubes
1	Tongs, crucible, rust proofed
1	Triangle, pipe stemmed, 2 in.
2	Watch glasses, 3½" dia.
2	Squares of wire gauze, asbestos center, 5" x 5"
1	Wire, platinum, with glass handle
2	Thistle tubes
2	Pieces of tubing, glass, 3"

B. Usually Kept in Cupboard

1	Bunsen Burner, with needle valve (if gas available)
1	Bunsen Burner wing top (if gas available)
2½	ft. of Bunsen Burner Tubing (if gas available)
1	Bunsen Burner tripod
2	Burette clamps
1	Deflagrating spoon, brass
1	Mortar, porcelain, 6.5 cm.
1	Pneumatic trough, galvanized, 5" x 7" x 10"
1	Ring stand, 3 rings
3	ft. Rubber tubing, white, hand made, ¼" dia.
3	ft. Rubber tubing, white, hand made, ¼" dia.
1	Sand bath, 5 inch, shallow
1	Tripod, 5"

*Director of Educational Research, Kewaunee Manufacturing Co., Adrian, Mich.

[1] *The Nation's Schools*, Vol. 35, No. 6, June, 1945, p. 29.

C. Usually Kept on Shelf Above Chemistry Table or on Shelf at Side of Room

1 Reagent bottle for hydrochloric acid, 250 c.c.
1 Reagent bottle for sulphuric acid (conc.), 250 c.c.
1 Reagent bottle for sulphuric acid (dilute) 250 c.c.
1 Reagent bottle for nitric acid, 250 c.c.
1 Reagent bottle for sodium hydroxide, 250 c.c.
1 Reagent bottle for ammonium hydroxide, 250 c.c.

Note. While some chemists recommend that all iron equipment be kept clean and left on top of the student's table, the major portion advise that such be stored in the cupboard.

As a subsidary check on the list of items to be stored in the drawer and in the cupboard of the student's table, lists of such items were secured from the teachers of chemistry in a representative group of ten Michigan high schools, located in communities varying in population from 2500 to 64,000. The maximum number of items given on any one of these lists was 52 (for one of the largest high schools in the state) as compared with 75 on the master list that had been prepared in this study. The average number of items given on the lists of the ten high schools was 34. It is likely, therefore, that storage provision for 60 items of equipment in the individual student's table will meet the storage requirements in any high school, while the requirements of the smaller high schools will be appreciably less.

On the basis of necessary storage areas and storage volumes computed, the provision of the following *minimum* storage facilities in the individual student's desk is recommended:

For high schools above average size and in which separate chemistry laboratories are ordinarily available:

One drawer approximately 9 in. wide, 8 in. high, 18 in. deep

One cupboard approximately 10 in. wide, 20 in high, 28 in. deep.

For small to average size high schools in which the same laboratory is ordinarily used for both physics and chemistry, and sometimes for other science work:

One drawer approximately 8 in. wide, 6 in. high, 10 in. deep.

One cupboard approximately 13 in. wide, 15 in. high, 15 in. deep.

New combination science tables, that provide the required storage capacity, are now available for small high schools.

II. Storage of Chemicals, Battery Materials, and Other Materials in Stockroom Cases

Storage of chemicals, battery materials, and other materials in stockroom cases.

This list of items was made through merging all such items that appeared on any of the lists of four state departments of education or on any of the lists given for use with any one of four leading textbooks and laboratory manuals in high school chemistry. The amounts of materials allocated for classroom demonstrations and for the use of individual students are merged in the list.

Maximum amounts of the items are listed in column I for 20 to 24 students, in column II for 13 to 19 students, and in column III for classes up to 12 students.

ITEMS	I	II	III
Acetone	1 lb.	¾ lb.	½ lb.
Acid, acetic	1 lb.	1 lb.	1 lb.
Acid, acetic, glacial, 99½% C.P.	1 lb.	1 lb.	
Acid, arsenous, tech. powder	¼ lb.	¼ lb.	¼ lb.
Acid, benzoic	1 lb.	¾ lb.	1 oz.
Acid, boric, crystals, C.P.	1 lb.	¾ lb.	4 oz.
Acid, butric	4 oz.	4 oz.	4 oz.
Acid, citric	1 lb.	½ lb.	4 oz.
Acid, formic	1 oz.	1 oz.	1 oz.
Acid, gallic	¼ lb.		
Acid, hydrochloric, C.P. (conc.)	12 lb.	9 lb.	6 lb.
Acid, hydrochloric, tech.	12 lb.	9 lb.	6 lb.
Acid, hydrofluoric, tech.	12 lb.	6 lb.	2 lb.
Acid, lactic	¼ lb.	⅛ lb.	1 oz.
Acid, nitric, C.P. (conc.)	7 lb.	7 lb.	7 lb.
Acid, oleic, U.S.P.	1 lb.	½ lb.	
Acid, oxalic, pure crystals	1 lb.	1 lb.	1 lb.
Acid, pyrogallic	2 oz.	2 oz.	2 oz.
Acid, salicylic, U.S.P.	4 oz.	2 oz.	1 oz.
Acid, stearic, U.S.P., powdered	1 lb.	½ lb.	
Acid, sulphuric, C.P. (conc.)	18 lb.	9 lb.	9 lb.
Acid, sulphuric, water white	9 lb.	9 lb.	9 lb.
Acid, tannic, U.S.P., light	¼ lb.	¼ lb.	¼ lb.
Acid, tartaric, crystals	4 oz.	4 oz.	1 oz.
Agar nutrient standard	¼ lb.	2 oz.	1 oz.
Albumen of egg	1 oz.		
Alizarien paste, 20%	¼ lb.	2 oz.	1 oz.
Alcohol, amylic	1 lb.	1 lb.	1 lb.
Alcohol, butyl, normal	¼ lb.	⅛ lb.	
Alcohol, ethel, denatured, 95%	4 qts.	3 qts.	2 qts.
Alcohol, isopropyl	1 lb.	1 lb.	
Alcohol, methyl	1 qt.	1 qt.	1 pt.
Alum (ammonium), purified	1 lb.	1 lb.	1 lb.
Aluminum ammonium sulphate, crystals, pure, metal mossy	1 lb.	1 lb.	¼ lb.
Aluminum chloride	1 lb.	1 lb.	⅛ lb.
Aluminum nitrate	¼ lb.	¼ lb.	2 oz.
Aluminum sodium sulphate	1 lb.	½ lb.	
Aluminum sulphate, tech.	1 lb.	1 lb.	1 lb.
Aluminum turnings	¼ lb.	¼ lb.	¼ lb.
Ammonium bifluoride	4 oz.	4 oz.	4 oz.
Ammonium carbonate, lumps, C.P.	1 lb.	1 lb.	1 lb.
Ammonium chloride, pure, white, granular	1 lb.	1 lb.	1 lb.
Ammonium hydroxide, C.P., conc.	8 lb.	8 lb.	8 lb.
Ammonium molybdate solution, C.P.	1 lb.	1 lb.	1 lb.
Ammonium nitrate, granular, C.P.	1 lb.	1 lb.	1 lb.
Ammonium oxalate	1 lb.	½ lb.	¼ lb.
Ammonium sulphate, pure	5 lb.	5 lb.	5 lb.
Ammonium sulphide solution, C.P., light	1 lb.	1 lb.	1 lb.
Amyl acetate, tech.	¼ lb.		
Aniline, C.P.	¼ lb.	¼ lb.	
Aniline, color, blue, methylene, basic	1 oz.		
Aniline, color, red fuchsine, acid	1 oz.		
Aniline, dye, congo red	1 oz.	1 oz.	
Aniline, dye, malachite green	1 oz.	1 oz.	
Aniline, dye, methyl violet	1 oz.	1 oz.	
Aniline, hydrochloride	¼ lb.	⅛ lb.	
Antimony chloride	¼ lb.	¼ lb.	¼ lb.
Antimony metal, lumps	¼ lb.	¼ lb.	¼ lb.
Antimony metal, powdered	¼ lb.	¼ lb.	¼ lb.
Antimonyl potassium tartrate, pure	¼ lb.	¼ lb.	
Arsenic metal, crystals	¼ lb.	⅛ lb.	
Arsenic trioxide	¼ lb.	¼ lb.	¼ lb.
Barium chloride, C.P., granular	1 lb.	1 lb.	1 lb.
Barium hydroxide	¼ lb.	¼ lb.	¼ lb.
Barium nitrate, tech.	¼ lb.	¼ lb.	
Barium sulphate, tech., powder	1 lb.	1 lb.	¼ lb.
Battery jars, 5 by 7 in.	6	4	1
Beef extract, conc.	2 oz.		
Benzene, pure	1 pt.	1 pt.	1 pt.
Benzol	1 lb.	1 lb.	1 lb.
Bismuth metal, C.P.	1 oz.	1 oz.	1 oz.
Bleaching powder	1 lb.	1 lb.	1 lb.
Boneblack, pure	1 lb.	1 lb.	1 lb.
Borax, pure	1 lb.	1 lb.	1 lb.
Bromine, C.P.	4 oz.	4 oz.	4 oz.
Cadminuf chloride, C.P., crystals	1 oz.	1 oz.	1 oz.
Cadminum metal, mossy	¼ lb.		
Cadminum nitrate	1 oz.		
Cadminum sulphate	1 oz.	1 oz.	1 oz.
Calcium bisulfide	1 lb.		
Calcium carbide, tech.	2 lb.	2 lb.	2 lb.
Calcium carbonate (marble chips)	5 lb.	5 lb.	5 lb.
Calcium chloride, tech., anhydrous, 4 mesh	2 lb.	2 lb.	2 ib.
Calcium fluoride, tech., powder	1 lb.	1 lb.	1 lb.
Calcium hydroxide, C.P.	5 lb.	3 lb.	2 lb.
Calcium hypochlorite (bleaching powder)	¾ lb.	¾ lb.	
Calcium metal	1 oz.	1 oz.	1 oz.
Calcium nitrate	¼ lb.	⅛ lb.	
Calcium oxide	5 lb.	3 lb.	2 lb.
Calcium phosphate, mono, tech.	1 lb.	4 oz.	2 oz.
Calcium sulphate, native, lumps (gypsum)	2 lb.	2 lb.	1 lb.
Calcium sulphate (plaster of Paris)	5 lb.	5 lb.	5 lb.
Camphor, refined	¼ lb.		
Carbon, black	2 oz.	2 oz.	2 oz.
Carbon, disulphide, pure	2 lb.	2 lb.	2 lb.
Carbon, tetrachloride, pure	1 lb.	1 lb.	1 lb.
Casein, tech.	¼ lb.	¼ lb.	¼ lb.
Charcoal, animal powder	1 lb.	1 lb.	
Charcoal, wood, lumps	1 lb.	1 lb.	1 lb.
Chlorine water	1 lb.		
Chloroform, pure	1 lb.	1 lb.	1 lb.
Chromium nitrate, C.P.	¼ lb.		
Chromium potassium sulphate, pure lumps	¼ lb.	¼ lb.	
Chromium sulphate, C.P., crystals	4 oz.	4 oz.	
Cobalt chloride, C.P.	1 oz.	1 oz.	
Cobalt nitrate, C.P., crystals	1 oz.	1 oz.	1 oz.
Cobalt oxide	1 oz.	1 oz.	1 oz.
Collodion, U.S.P., solution	¼ lb.		
Congo red	1 oz.	1 oz.	1 oz.
Copper carbonate	1 lb.	1 lb.	1 lb.
Copper chloride (ic), purified, crystals	¼ lb.		
Copper foil Copper metal foil, 0.005" thick	1 lb.	½ lb.	¼ lb.
Copper metal sheet (scrap)	2 lb.	2 lb.	2 lb.
Copper metal turnings, light	2 lb.	1 lb.	1 lb.
Copper nitrate, C.P.	1 lb.	1 lb.	1 lb.
Copper (ic) oxide, tech., powder	1 lb.	½ lb.	¼ lb.
Copper (ous) oxide	¼ lb.	⅛ lb.	1 oz.
Copper (ic) sulphate, C.P., crystals	2 lb.	2 lb.	2 lb.
Copper turnings or shots	1 lb.	1 lb.	1 lb.
Dextrine, tech., white	1 lb.	½ lb.	4 oz.
Dextrose, U.S.P.	1 lb.	1 lb.	1 lb.
Disodium hydrogen phosphate, tech. crystal	1 lb.	1 lb.	1 lb.
Ethel acetate	¼ lb.		
Ethylene, glycol	1 pt.		
Ether, ethyl, pure	1 lb.	1 lb.	1 lb.
Fehling's solution A	4 oz.	4 oz.	4 oz.
Fehling's solution B	4 oz.	4 oz.	4 oz.

ITEMS	I	II	III
Formaldehyde, 40%, C.P.	1 lb.	1 lb.	1 lb.
Formalyn	1 lb.	1 lb.	1 lb.
Fuschine	2 oz.	2 oz.	2 oz.
Gallein	1 lb.		
Gelatin	2 oz.	2 oz.	2 oz.
Glass tubing, 6mm. dia.	24 lb.	16 lb.	8 lb.
Glass tubing, 5 to 8mm. dia.	5 lb.	3 lb.	2 lb.
Glass tubing, 15mm., bore, 30 cm. long 1.8mm. wall	2 lb.	2 lb.	1 lb.
Glass wool	¼ lb.	2 oz.	2 oz.
Glucose, tech., granulated	1 lb.		
Glycerine, U.S.P.	1 lb.	1 lb.	1 lb.
Graphite	2 oz.	2 oz.	2 oz.
Gum arabic, U.S.P., white powder	1 lb.	½ lb.	¼ lb.
Gum, tragacinth, powder	¼ lb.		
Gunpowder, black	¼ lb.	¼ lb.	¼ lb.
Hydrogen peroxide	1 lb.	1 lb.	1 lb.
Hydroquinons	¼ lb.	¼ lb.	¼ lb.
Iodine, U.S.P., resublimed	¼ lb.	2 oz.	1 oz.
Iodine, tincture, U.S.P.	1 oz.		
Iron (ous) ammonium sulphate	¼ lb.	¼ lb.	¼ lb.
Iron (ic) ammonium citrate	1 lb.	½ lb.	¼ lb.
Iron (ic) chloride, C.P.	1 lb.	½ lb.	¼ lb.
Iron metal, powder	¼ lb.	¼ lb.	¼ lb.
Iron metal, filings	1 lb.	1 lb.	1 lb.
Iron nitrate	¼ lb.		
Iron (ic) oxide, tech.	1 lb.		
Iron (ic) sulphate	1 lb.	1 lb.	1 lb.
Iron (ous) sulphate crystals, pure	1 lb.	½ lb.	
Iron (ic) sulphide	1 lb.		
Iron (ous) sulphide, lumps	5 lb.	3 lb.	2 lb.
Junket tablets	1 vial	1 vial	
Kaolin, powdered	1 lb.		
Kerosene	1 lb.	1 lb.	1 lb.
Lactose	¼ lb.	¼ lb.	¼ lb.
Lanolin, anhydrous	1 lb.		
Lead acetate, C.P., crystals	1 lb.	1 lb.	1 lb.
Lead carbonate, dry, basic	1 lb.	½ lb.	¼ lb.
Lead dioxide, tech., brown	1 lb.	½ lb.	¼ lb.
Lead foil	1 oz.	1 oz.	1 oz.
Lead nitrate, tech.	1 lb.	½ lb.	¼ lb.
Lead (mono) oxide (litharge) pure	1 lb.	½ lb.	¼ lb.
Lead sulphide (galena)	¼ lb.	¼ lb.	¼ lb.
Lithium chloride	1 oz.	1 oz.	1 oz.
Litmus cubes, blue	¼ lb.	¼ lb.	¼ lb.
Litmus paper, blue	12 vials	8 vials	6 vials
Litmus paper, red	12 vials	8 vials	6 vials
Logwood Extract	¼ lb.	⅛ lb.	1 oz.
Magnesium Carbonate, powder, light, pure	¼ lb.	⅛ lb.	
Magnesium metal ribbon	1 oz.	1 oz.	1 oz.
Magnesium oxide	1 lb.	½ lb.	¼ lb.
Magnesium sulphate	2 oz.	2 oz.	2 oz.
Malachite green	1 oz.	1 oz.	1 oz.
Manganese chloride	¼ lb.	¼ lb.	¼ lb.
Manganese dioxide, native, powder, tech.	2 lb.	2 lb.	2 lb.
Manganese (ous) nitrate, C.P., solution	¼ lb.		
Marble chips	5 lb.	5 lb.	5 lb.
Menthol violet	1 oz.	1 oz.	1 oz.
Mercury (ic) chloride, C.P., granular	¼ lb.	4 oz.	1 oz.
Mercury metal, virgin grade	1 lb.	1 lb.	1 lb.
Mercury (ic) nitrate, C.P.	1 oz.	1 oz.	
Mercury (ous) nitrate, C.P.	¼ lb.	¼ lb.	¼ lb.
Mercury (ic) oxide, red, C.P.	½ lb.	½ lb.	½ lb.
Mercury (ic) sulphate, C.P.	1 oz.	1 oz.	1 oz.
Methyl orange solution	1 oz.		
Methyl salicylate (synthetic oil of wintergreen)	¼ lb.		
Napthalene, flakes	1 lb.		
Nickel ammonium sulphate	¼ lb.		
Nickel formate (Baker)	1 lb.		
Nickel nitrate	¼ lb.	4 oz.	
Nickel sulphate	¼ lb.	¼ lb.	¼ lb.
Oil, castor, white	¼ lb.		
Oil, cocoanut	¼ lb.		
Oil, cottonseed	1 pt.		
Oil, eucalyptus	1 oz.		
Oil, linseed, boiled	1 pt.		
Oil, linseed, raw	1 pt.		
Oil, mineral, paraffin oil	1 pt.	1 pt.	
Oil, olive	¼ lb.		
Oil, soy bean	1 pt.		
Oil, peppermint	1 oz.		
Oil, wintergreen, synthetic	¼ lb.		
Oil, thyme, thymol	1 oz.		
Pancreatic extract	¼ lb.	¼ lb.	¼ lb.
Paraffin	1 lb.	1 lb.	1 lb.
Pepsin, U.S.P.	1 oz.		
Petrolic ether	1 qt.		
Petroleum, white	1 lb.		
Phenol, crystals	1 lb.		
Phenolphthalein, pure	1 oz.	1 oz.	1 oz.
Phosphorus, red amorphous	¼ lb.	¼ lb.	¼ lb.
Phosphorus, yellow, sticks	1 oz.	1 oz.	1 oz.
Phosphorus, white	¼ lb.	¼ lb.	¼ lb.
Phosphorus, pentoxide	¼ lb.	¼ lb.	¼ lb.
Photographer developer, tube	1 tube	1 tube	1 tube
Portland cement	2 lb.	2 lb.	2 lb.
Potassium acid sulphate	¼ lb.		
Potassium acid tartrate, pure	¼ lb.	¼ lb.	¼ lb.
Potassium bichromate, tech., crystals	1 lb.	1 lb.	1 lb.
Potassium bitartrate	¼ lb.	¼ lb.	¼ lb.
Potassium bromide, granular, pure	1 lb.	1 lb.	1 lb.
Potassium chlorate, cystals, pure	2 lb.	1 lb.	1 lb.
Potassium chloride, pure	1 lb.	1 lb.	1 lb.
Potassium chromate, pure	¼ lb.	¼ lb.	¼ lb.
Potassium dichromate, pure	1 lb.	1 lb.	1 lb.
Potassium ferricyanide	1 lb.	1 lb.	1 lb.
Potassium ferrocyanide, C.P., crystals	1 lb.	1 lb.	1 lb.
Potassium hydroxide	2 lb.	2 lb.	2 lb.
Potassium iodide, U.S.P.	¼ lb.	¼ lb.	¼ lb.
Potassium metal	1 oz.	1 oz.	1 oz.
Potassium nitrate, pure	2 lb.	2 lb.	2 lb.
Potassium permanganate	¼ lb.	¼ lb.	¼ lb.
Potassium sulphate, C.P., granular	1 lb.	1 lb.	1 lb.
Potassium sulphocyanate	¼ lb.	¼ lb.	¼ lb.
Potassium sulphocyanide	1 oz.		
Potassium thiocyanate, C.P.	1 oz.	1 oz.	1 oz.
Pyrethrum	1 lb.		
Resorcin	1 oz.	1 oz.	1 oz.
Rosin, W.W. lump	1 lb.	½ lb.	¼ lb.
Rubber, natural	¼ lb.	¼ lb.	¼ lb.
Saccharine, U.S.P., sol, powder	¼ lb.		
Sand, washed and ignited	1 lb.	1 lb.	1 lb.
Schiff's reagent	1 oz.		
Shellac, white, dry	¼ lb.		
Silver nitrate	¼ lb.	¼ lb.	¼ lb.
Soap, castile	1 lb.	1 lb.	1 lb.
Soap, green oil	2 lb.		
Soap, solution, standard	1 lb.		
Soda lime, fused	¼ lb.		
Sodium acetate, C.P., fused, crystals	1 lb.	1 lb.	¼ lb.
Sodium aluminum sulphate	2 oz.	2 oz.	2 oz.
Sodium ammonium hydrogen phosphate	¼ lb.	¼ lb.	¼ lb.
Sodium benzoate	¼ lb.	¼ lb.	¼ lb.
Sodium bicarbonate, powder, pure	1 lb.	1 lb.	1 lb.
Sodium bisulphide	½ lb.	½ lb.	½ lb.
Sodium bisulphite	1 lb.	½ lb.	
Sodium borate	1 lb.	1 lb.	1 lb.
Sodium bromide, pure	1 lb.	1 lb.	1 lb.
Sodium calcium hydroxide	1 lb.	1 lb.	1 lb.
Sodium carbonate, tech., calcined	1 lb.	1 lb.	1 lb.
Sodium chlorate	1 lb.	1 lb.	1 lb.
Sodium chloride, white, fine	5 lb.	2 lb.	
Sodium chloride, tech., coarse rock salt	2 lb.	3 lb.	5 lb.
Sodium chromate, C.P.	¼ lb.		
Sodium hydroxide, sticks, C.P.	2 lb.	2 lb.	2 lb.
Sodium hydroxide, normal solution	2 gals.	2 gals.	2 gals.
Sodium hyposulphite	1 pt.		
Sodium iodide, solution	¼ lb.	¼ lb.	¼ lb.
Sodium, metal	¼ lb.	¼ lb.	¼ lb.
Sodium nitrate, pure crystals	1 lb.	1 lb.	1 lb.
Sodium nitrate	½ lb.	½ lb.	½ lb.
Sodium peroxide	1 lb.	½ lb.	¼ lb.
Sodium phosphate, dibasic, C.P., crystals	1 lb.	1 lb.	1 lb.
Sodium phosphate, mono, C.P.	1 oz.	4 oz.	2 oz.
Sodium phosphate, tertiary, tech., crystals	1 lb.	1 lb.	1 lb.
Sodium potassium tartrate, powder, pure	1 lb.	1 lb.	1 lb.
Sodium silicate, solution	1 lb.	1 lb.	1 lb.
Sodium sulphate, tech., crystals	2 lb.	2 lb.	2 lb.
Sodium sulphide	¼ lb.	¼ lb.	¼ lb.
Sodium sulphite	1 lb.	1 lb.	1 lb.
Sodium tetraborate	¼ lb.		
Sodium thiosulphate	2 lb.	2 lb.	2 lb.
Starch, corn	1 lb.	½ lb.	
Starch, potato	1 lb.	1 lb.	1 lb.
Steel wool (domestic)	½ lb.	¼ lb.	
Strontium chloride, C.P.	¼ lb.	¼ lb.	¼ lb.
Strontium nitrate	¼ lb.	2 oz.	1 oz.
Sucrose, granulated sugar	2 lb.	2 lb.	2 lb.
Sulphur, flowers	1 lb.	1 lb.	1 lb.
Sulphur, roll	5 lb.	3 lb.	2 lb.
Talcum	1 lb.		
Test paper, tumeric	6 vials	4 vials	2 vials
Thermit, black	4 oz.	4 oz.	4 oz.
Thermit, ignition mixture	½ lb.	½ lb.	½ lb.
Tin, metal	2 lb.	1 lb.	½ lb.
Toluidine, ortho	¼ lb.		
Triethanolamine (ERP-1399), tech.	1 lb.		
Turpentine, spirits of	1 lb.	1 lb.	1 lb.
Wax, carnauba	1 lb.		
Wax, ceresin, white	¼ lb.		
Wire, aluminum	4 oz.	4 oz.	4 oz.
Wire, copper, No. 30	1 lb.	1 lb.	1 lb.
Wire, picture, No. 0	2 lb.	2 lb.	2 lb.
Wire, platinum & foil	1 oz.	1 oz.	1 oz.
Witch hazel	¼ lb.		
Wood's metal	1 lb.	1 lb.	1 lb.
Zeolite	1 lb.	1 lb.	1 lb.
Zinc chloride	2 lb.	1 lb.	1 lb.
Zinc dust	1 lb.	1 lb.	1 lb.
Zinc metal, mossy	2 lb.	2 lb.	2 lb.
Zinc metal sheet, B & S gauze 30	1 lb.	1 lb.	1 lb.
Zinc nitrate	4 oz.	4 oz.	
Zinc oxide	¼ lb.	¼ lb.	¼ lb.
Zinc powder	¼ lb.	¼ lb.	¼ lb.
Zinc sulphate	1 lb.	1 lb.	1 lb.
Zinc sulphide	1 oz.	1 oz.	

(To be concluded in February)

Cleveland Plans Elementary Schools

William R. Murphy

Although total public school enrollment has been decreasing for a number of years in Cleveland, Ohio, the board of education has begun the erection of educational structures which will cost more than half a million dollars.

The necessity for the expenditure of funds for two elementary schools, and additions to two others, is found in the fact that certain districts have an overcrowded condition, due largely to the presence of hundreds of families of warworkers, about 75 per cent of whom have expressed their intention of remaining in their present locations. Many of these families originally came from localities where the educational advantages were not so favorable, and it is considered quite probable that one of the principal reasons for their remaining in Cleveland lies in the benefits to be derived from the schools of the city.

School Population Declines

In October, 1944, there were 105,197 pupils registered in the Cleveland schools. In October, 1945, this figure had dropped to 102,116, a decrease of 3081, or approximately 3 per cent.

Cleveland high-school enrollments have decreased about one third since 1940, due in large part to war conditions — enlistment in the services, enticing jobs in war plants, and other reasons connected directly or indirectly with the war.

The junior high schools have been losing enrollment since 1935, and the elementary grades since 1925. But the elementary grades may soon begin to increase again, because of the higher birth rate in the years 1933 to 1943. The kindergarten has already begun to increase slightly even though parochial schools in Cleveland also opened some kindergartens last year for the first time.

The downward trend in school population, according to Mr. Gerald E. Irons, commissioner of school housing, is a result of the reduction in the size of families, noticeable in the vital statistics since 1900, and caused by a falling birth rate. This trend continued until 1933. Then the birth rate began to rise, and a slow upward trend continued into 1939, and rose rapidly until 1943. The children born in this period are now enrolled in kindergarten, or in the lower elementary grades.

The smallest class which ever entered Cleveland schools in modern times is now in junior high school. Therefore, continued reduction in secondary schools is likely for several years, before the effects of the recent increase in the birth rate begin to affect the registration.

Government Housing Projects Change the Picture

There are three sections in the city where government housing projects have affected the school population — the Riverside Park Project, in West Park; the Brooklyn Acres Project, in South Brooklyn; and the Seville Homes, in the southeastern section of the city, known as Miles Heights. In the Riverside Park Project there are 440 family units; in Brooklyn Acres 340 family units, within the city limits; and 440 in Seville Homes.

Wartime Private Housing Accentuates the Situation

During the war period certain areas enjoyed a large amount of home building by private individuals and by home-building contractors. For example, in the northwestern section of the West Park area one private company erected more than 300 family units in duplex houses, and in addition several hundred single houses were built; the same condition prevailed, although not to such a great extent, in the South Brooklyn area; and in the section just south of Shaker Heights several hundred homes were erected during the same period. In terms of the number of families in the area last mentioned, known in educational circles as the Gracemount School section, there were 200 families in 1937, and 1150 families in 1944. Using the same measurement in the northwestern part of West Park, there were approximately 700 families in 1938, and 1700 families in 1943. A six-room addition to the Riverside School in this area was opened for use in June of this year.

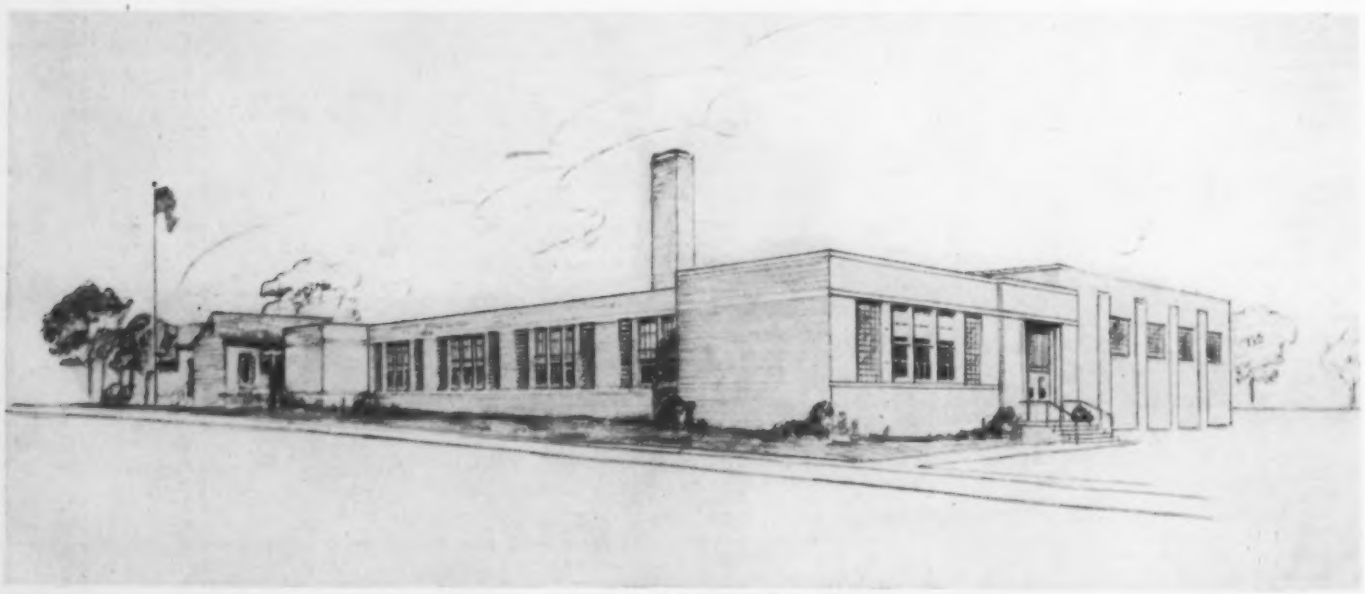
Thus both government and private housing contributed to the overcrowded conditions in all these sections, and since educational facilities must be provided for the children of all of these families, new structures are necessitated. In South Brooklyn and in the Gracemount areas new buildings are in process of construction, and in two other locations, in the West Park Area, additions to existing structures are being built.

How the Building Program is Handled

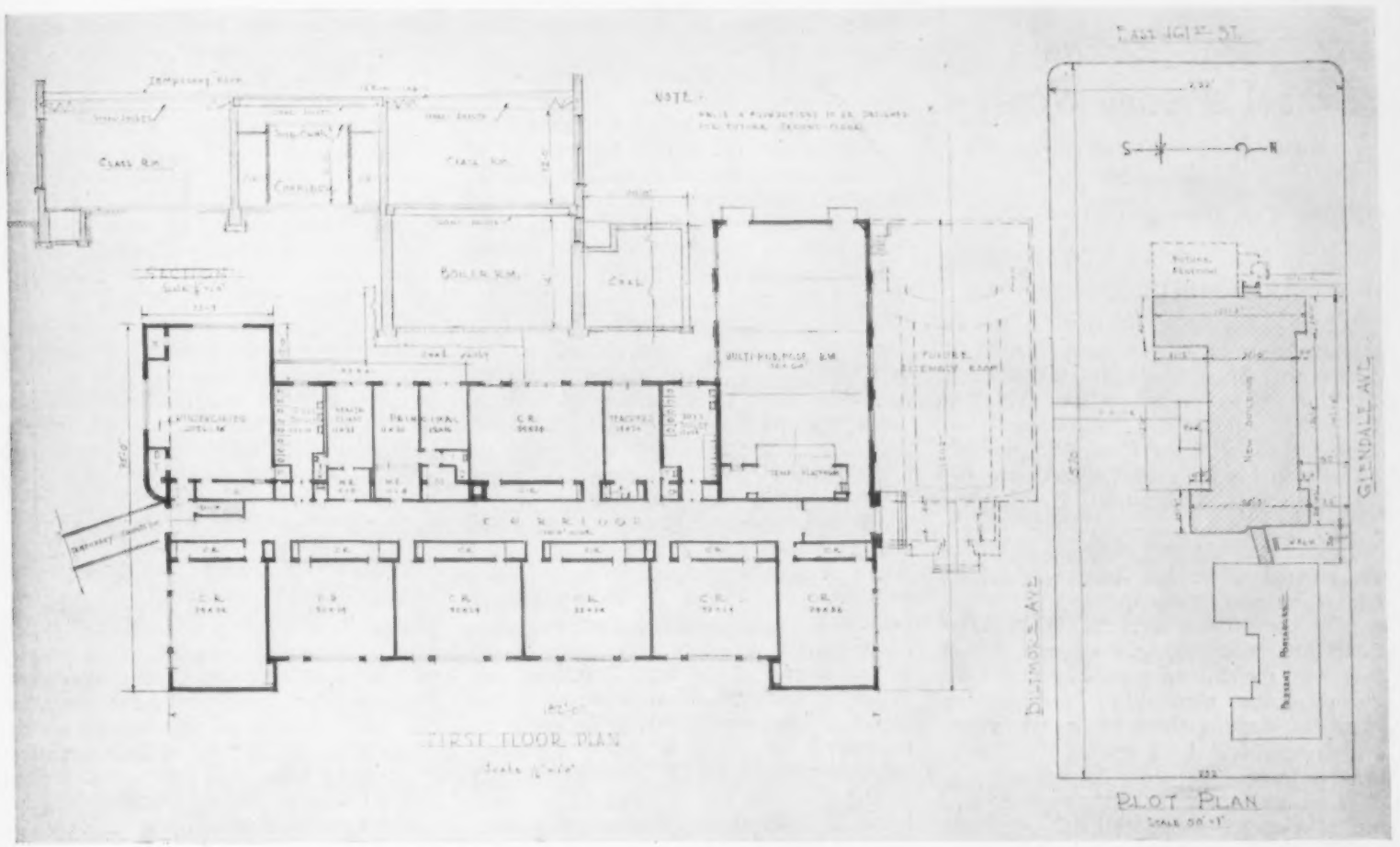
There are three separate divisions in the operations of the Cleveland board of education. The Department of Instruction is headed by Superintendent Charles H. Lake; the Department of Business is headed by Business Manager James F. Brown; and the Clerk-Treasurer's office is managed by Michael Wach. Each of these three heads reports directly to the board.

Mr. Irons is the educational planning consultant, specializing in housing, and it is his duty to make studies of the present and future needs of the school system, pertaining to the necessity for new structures, or additions — *where* they are needed, *when* they should be ready, and *what pupil capacity* should be provided for. He collaborates with the architects in the planning of schools, and acts as a liaison officer in presenting the recommendations of the superintendent of schools to the department of business, with respect to the educational requirements of both new and old school structures.

Arthur F. Baer is chief architectural draftsman for the board, and his office prepares the plans for small or moderate building programs. When large scale operations are in



The Gracemount School is a simple one story building which depends upon simple horizontal lines and excellent materials for its architectural effectiveness.



Floor plan of the Gracemount Elementary School, Cleveland, Ohio. — Arthur F. Baer, Architect, Cleveland board of education; Gerald E. Irons, superintendent of buildings.

the making, preliminary plans are prepared by his staff, and outside architects are engaged to prepare the working drawings and specifications.

A. G. Simon is superintendent of buildings, and has general oversight of the architectural and engineering design, budgeting, contracting and supervision of construction.

A. F. Nienhuser is commissioner of equipment and supplies, and is responsible for the selection and furnishing of the educational equipment required.

All of these men, with Superintendent Lake, Business Manager Brown, and Clerk-Treasurer Wach, are active in building operations — subject, of course, to the final decision of the board of education.

The Board Decides to Build

While the main concern of the Board in recent years has been that of modernization and replacement of old school plants, it was decided that *two new buildings* and *two additions* are *"must"* if the educational needs of Cleveland's school population are to be fulfilled. Therefore plans were drawn and contracts let, to erect the necessary structures, and in October ground was broken for the four new buildings. Appropriate ceremonies were conducted at the building sites, with President Mrs. Norma Wulff and other members of the board participating, together with officials of the three departments.

Cost of Structures

The new building at East 161st Street and Glendale Avenue, south of Shaker Heights, known as the Gracemount School, will cost $192,484; the Memphis School at West 59th Street and Memphis Avenue, in South Brooklyn will cost $125,064; the addition to Puritas School at 18100 Puritas Avenue will amount to $86,301; and the addition to the Garfield School at 3800 West 140th Street, will cost $85,881. These figures are for building costs only.

The two new buildings, and two additions, including all architectural and engineering fees, equipment, etc., will total approximately $565,000.

Gracemount School

The Gracemount School is a one-story brick edifice, so planned and constructed that another story can be added later. It will contain a kindergarten room, seven classrooms, a teachers' room, an office suite, a health clinic, rest rooms, a combination gymnasium and assembly room with a temporary stage, a boiler room, custodian's quarters, and ample storage space.

At present a temporary 6-room building housing 321 pupils, is being used on this site. It is planned at some future date to add a story to the new building, also a new auditorium, and to tear down the temporary structure. Until that time, however, the temporary building will continue in use. The new building will house 340 pupils; it will be heated with oil; and it will be connected by a passageway with the old building.

The electrical plan includes louvered flush ceiling fixtures in the gymnasium, and fluorescent lighting in all of the other educational rooms. The ceilings will be covered with an acoustical material in all of the classrooms, corridors, gymnasium, and offices. It will be a perforated type of fiber-tile covering, in an off-white color, which can be painted, and it will give a light reflection of 75 per cent.

In the elementary classrooms there will be a narrow cloakroom on the corridor side, which will make it possible to recess the doors. The main bearing wall will be the classroom wall. This arrangement allows a maximum amount of classroom wall space, and also lends flexibility, because the partitions between the rooms are single-tile walls, which can be easily removed or relocated to increase or decrease room size, if required by conditions existing at any time. This plan also reduces the amount of building cubage needed for pipes and ducts.

New Lighting Plan

All of the new buildings will have fluorescent lighting in the classrooms. Each room will be equipped with six 2-tube, 4 ft. units, mounted on the ceiling. According to tests made, this type of lighting provides excellent illumination at a very economical cost. It is a direct light, but the brightness is not enough to cause a glare on the desks.

The lighting will be installed at a height of about 8 ft. 6 in., above the desks, giving a 15 to 18 candle-power lighting at desk level. At this height, the fluorescent tubes are above the normal range of vision of pupils. They are also partially shielded by reflectors. Therefore, additional shielding by louvers underneath has been found to be unnecessary, and the inexpensive industrial-type fixture gives excellent results.

(Concluded on page 82)

The American
School Board Journal
A Monthly Periodical of School Administration
Edited by
Wm. Geo. Bruce and Wm. C. Bruce

SCHOOL BUILDINGS IN 1946

THE school building situation at the beginning of 1946 is more troublesome for school boards and their professional staffs than any situation which has existed in the past. Certainly the problems are more complicated and more filled with opportunities than the difficulties which were met by the school authorities in 1919 and 1920.

In the long interval between 1941 and the present, there has developed a huge banked-up need for new school buildings, due to the virtual stoppage of construction, the accelerated obsolescence of old buildings, the shift of populations, and the growth of new communities. In developing plans for meeting these needs, the school boards will have to overcome such problems as these:

There are in the making numerous and radical changes in educational programs and in school organization, which must be taken into account in planning for the use of the new buildings. New standards may be anticipated with certainty in such departments as physical education, industrial arts, occupational preparatory courses, library service, community uses, adult education, etc. The public soon will recognize the educational service of the elementary school as equal to that of the secondary school; the rural areas will demand as broad an educational program as the economically better situated urban communities. The total cultural and social opportunity for service at all school levels is something which must be planned for in more generous teaching units — classrooms and laboratories, workrooms, auditoriums and gymnasiums — both in the school building itself and in the site with its playgrounds, parking spaces, planting areas, and gardens.

The coming educational changes will necessitate less reference to precedent and more independent planning of each unit type of teaching area, and of the combination of these areas into a flexible, integrated building whole. The creative powers of all groups responsible for new buildings must be brought to bear in this planning — not merely the architect and the superintendent. Present standards of plan and arrangement cannot be assumed to be permanent any more than teaching methods or total educational programs. Hence a large measure of flexibility will be essential in plans and in construction methods so that changes can be made with a minimum of cost or disturbance of built-in mechanical services.

There is a challenge in the exterior design of new schoolhouses. The idea that schools should be less monumental, less cumbered with stairs and pillars, less repetitive of ancient detail, and less formally balanced, has brought with it modifications in scale and informality of arrangement that make a friendly appeal to children and harmonize with the domestic architecture surrounding most schools.

The modernization in design must be paralleled by the improvement in the selection of materials and construction methods. The old basic materials of stone, brick, concrete, and wood are certain to continue in use with, however, important betterment in their application. Glass in its new forms will undoubtedly play a more important part in schools, and steel, aluminum and plastics are due for wider uses just as soon as the experiences of war-use can be translated into peacetime buildings. Supplementing the structural improvement, much progress may be expected shortly in the heating and air conditioning methods. More freedom in the choice of means for securing optimum atmospheric conditions is clearly foreshadowed by the important New York State Survey just nearing completion. Improvement in lighting by fluorescent sources seems to be forecast in the promise of newly devised lamps and fixtures.

The archaic building codes in numerous states and larger cities will continue to hamper the planning of school buildings and delay the use of new materials, and economical sanitary installations. No code standards are truly useful unless they permit of reasonable revision on the basis of new inventions, of new materials, and new ability to plan for safety and utility.

The financing of school-building programs is at present as much a puzzle as it was a year ago. It is true that vast reductions have been made in the debts of city and rural school systems, and some school boards have accumulated building funds by direct taxation for later construction needs, but by far the greater number of school projects will require bond issues and many districts will not be able to do the needed job without outside help. School boards are fully justified in asking a share in the vast state-treasury surpluses. A bill now before Congress gives hope that federal aid will be forthcoming in fully adequate amounts, as a part of the full-employment program.

In deciding to place contracts for new buildings immediately or during the first six months of 1946, it will be necessary for boards to decide to what extent the schools should compete for the available labor now so badly needed for low-cost home construction and for the reconversion of industrial plants to peacetime production. Undoubtedly, some of the current competition is responsible for the rise in school construction cost in some areas from between 50 and 60 cents per cubic foot to 70 or 80 cents per cubic foot. Should school authorities limit their programs to the reduced amount of school buildings which can be bought at these new high prices, or should deferrable projects be put off until labor and materials are more readily available so that contractors can bid more closely and without the present undue risks? If we repeat the experiences of the years after World War I, when building costs were unreasonable and then settled down to levels which were higher than the pre-war costs but fully justified by the all-over economic situation, an answer to this problem is possible. In cases of immediate needs, the interest of the children, even more than economics, must supply the answer.

BUYING WAR SURPLUSES

DURING the past four years the buying methods of city school systems have undergone significant changes due to the scarcity of many needed supplies and equipment. The emergency conditions have compelled the school boards to rely heavily on the competence and honesty of their executives in charge of purchases and to cut the red tape involved in bidding routines, sampling and testing of materials, and insistence on long established standards for materials and quality of articles.

The coming opportunity of buying vast amounts of military surplus from a number of federal agencies also may well be considered an emergency in which simple, direct buying methods will save large sums and enable especially the small and less fortunate schools to round out their equipment in a number of special fields, with fine returns in higher teaching efficiency.

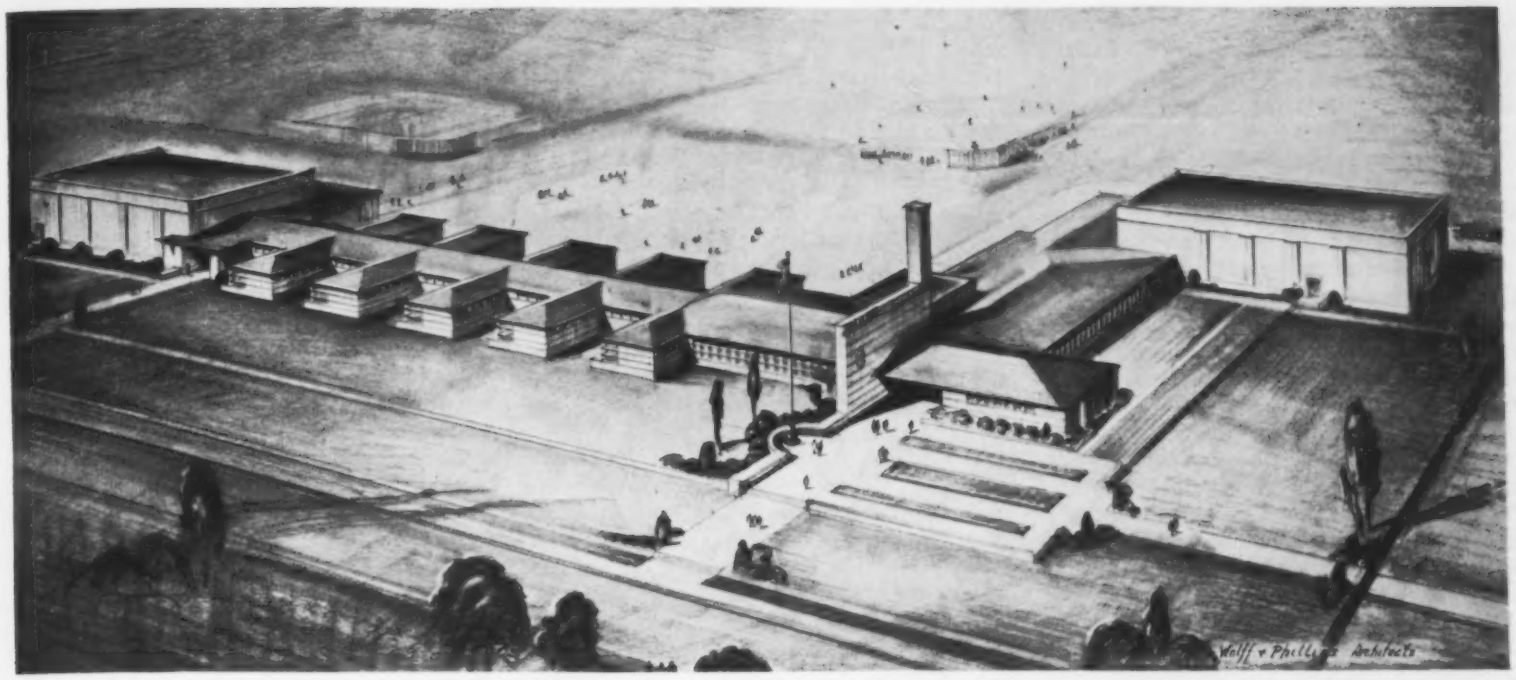
It is distinctly the job of the state departments to do a prompt job in organizing to act as channeling agencies, and to give local school districts prompt information and every other needed help to locate and obtain available school necessities.

MODERN ARCHITECTURE

It has seemed to me that the real tradition of architecture is that a building must express the material whereof it is built, the method whereby it is built, and the purpose wherefor it is built. Is it not true that we are in fact carrying on the real tradition of architecture? — *Hugh Ferriss.*

MEMORIALS

For memorials, let us not erect victory arches, shafts, or sculptured monuments. Let us instead build schools, hospitals, playgrounds, recreation centers, which will serve the life of the whole community. Let us dedicate these memorials to our valiant dead. But let us also dedicate them to the living and to the promise of the future. — *National Americanism Commission of the American Legion.*



Air view of the Colin Kelly Junior High School, Eugene, Oregon. — Wolff & Phillips, Architects, Portland, Oregon.

Eugene Plans a School-of-the-Future

Arthur W. Priaulx

What will school plants of tomorrow be like?

This puzzler is being asked today wherever school authorities meet. The responsibility of properly spending nearly two billion dollars for new school plants in the next few years, anticipating how the wartime technological advancements can be utilized to approach perfection in design and utility, rests uneasily on the shoulders of thousands of school officials.

In Oregon, at Eugene, Dr. Henry M. Gunn, city school superintendent, believes the dream-school-of-the-future has been planned in the new Colin Kelly Junior High School, designed by Portland's school architect, Truman Phillips. The eyes of western educators and builders have turned toward Eugene since plans for this unusual structure were first shown late this summer.

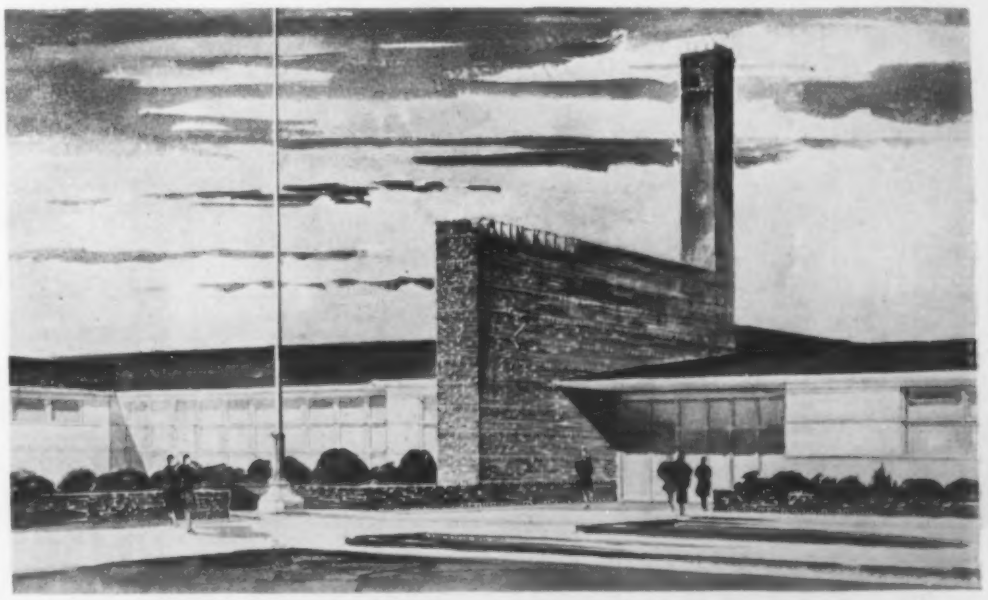
Dr. Henry M. Gunn is a progressive younger educational leader in the northwest, having served as assistant superintendent in Portland before accepting the Eugene post last year, and when he waxes enthusiastic schoolmen have learned that he has a good reason. Much of the daring departure in design in the new plant has been Gunn inspired, then translated into workable and buildable design by Truman Phillips.

The $335,000 Colin Kelly Junior High School embodies modern concepts of safety, convenience, usability, utility, and structural beauty. This educational building which will serve the rapidly growing suburban area adjoining Eugene on the north is as daring as the young hero's name which school children of that section selected democratically by ballot for the building.

Located in a setting of modern residences, all built within the past few years, the new schoolhouse is a spreading, single-story, all-wood structure which will conform to the community's homes and become a part of city planning.

"The trend in American school planning," says Dr. Gunn, "is to get off the highways and away from crowded, heavily traveled thoroughfares. We purchased twenty acres for the Colin Kelly unit about three fourths of a mile off the main highway bisecting this residential section. We have eliminated traffic hazards and dangers at once in this selection.

"With this large block of relatively inexpensive land we were able to design a spreading structure of wood which blends beautifully with neighboring homes. There is nothing foreboding about this school, which becomes



Main entrance to the Colin Kelly Junior High School, Eugene, Oregon, is accented by a distinctive pylon.

a welcome and integral part of the surrounding residences, and which is in sharp contrast to pretentious, multi-storied structures of steel and cement which never seem to be a part of the community.

"It is apparent at once after a close study of Colin Kelly school that we have achieved an edifice which is homey and approachable and has a warmth and beauty similar to that obtained from a well designed home," Dr. Gunn continued in discussing the general aspects of the plant. "There are other advantages in this type of spread-out, single-storied school. This type of schoolhouse is flexible, easily enlarged, and added to when the growth of the region requires, an important point in most western communities which have shown a steady growth in late years. We are using wood, which fits well into our great timbered northwest, and making use of materials for construction which are native to our region here in Oregon, Washington, and California."

Passing on over the advantages of exterior design which this new building possesses and the obvious utilization of amply available ground space which permits of single-storied construction, Dr. Gunn discussed enthusiastically the new features within the building.

Since much modern teaching is to teach by doing, the basic principle governing the plan of the schoolhouse is to make the structure a tool to aid in teaching. The monumental school building has no place in such a plan, Dr. Gunn pointed out.

"There are many innovations in Colin Kelly and it would be difficult to single out anyone as outstanding," the Eugene superintendent went on. "However, if you study the floor plan, you will note what we have done to the old-fashioned classroom. A part of each of the ten classrooms adjoins a conference room, where a progressive-minded instructor will find the privacy he has always wanted — a small room for conferences and counseling, and one where students can work on special projects and activities, but one definitely not intended as a 'dunce room.'"

The almost perfectly lighted classrooms, with three sides in windows, are another departure in design which the superintendent likes. He points out that since much of modern teaching is conducted more or less informally around conference tables, or at least since seating arrangement has progressed a pace from the rigid rows of seats, more light is essential. In these well-lighted classrooms students get maximum light on their work from three directions, eyestrain is virtually eliminated, and work becomes more pleasurable and easy.

Blackboards are placed on only one wall, that backing against the corridor, which conforms to the trend away from excessive blackboard use. The intent in designing this type of classroom is to create as flexible a teaching unit as possible which can be readily adapted to almost any type of teaching methods. It is to be noted that each conference room is equipped with sink and running water. The keynote throughout the building is more light, both natural and artificial, finest possible ventilation, and adequate and controlled heat to insure maximum health of students and faculty.

The matter of safety has been given particular study by both architect and school planners. No student will ever be more than 150 feet from an outside exit and, of course, with a building of one story, safety from fire should never be a problem. Hallways are wide enough to allow quick passage of the entire student body of 350 students in a matter of seconds. Incidentally, while the present school population in the Colin Kelly area totals 350, the school is being built to accommodate up to 450 pupils without crowding.

Facilities for student activities, apart from the regular curriculum, have become a vital part of this new building. At the end of one wing a fully equipped boys' gymnasium and basketball court has been provided to allow a well-rounded-out physical conditioning program during the entire school year. At the other wing end the girl students have similar

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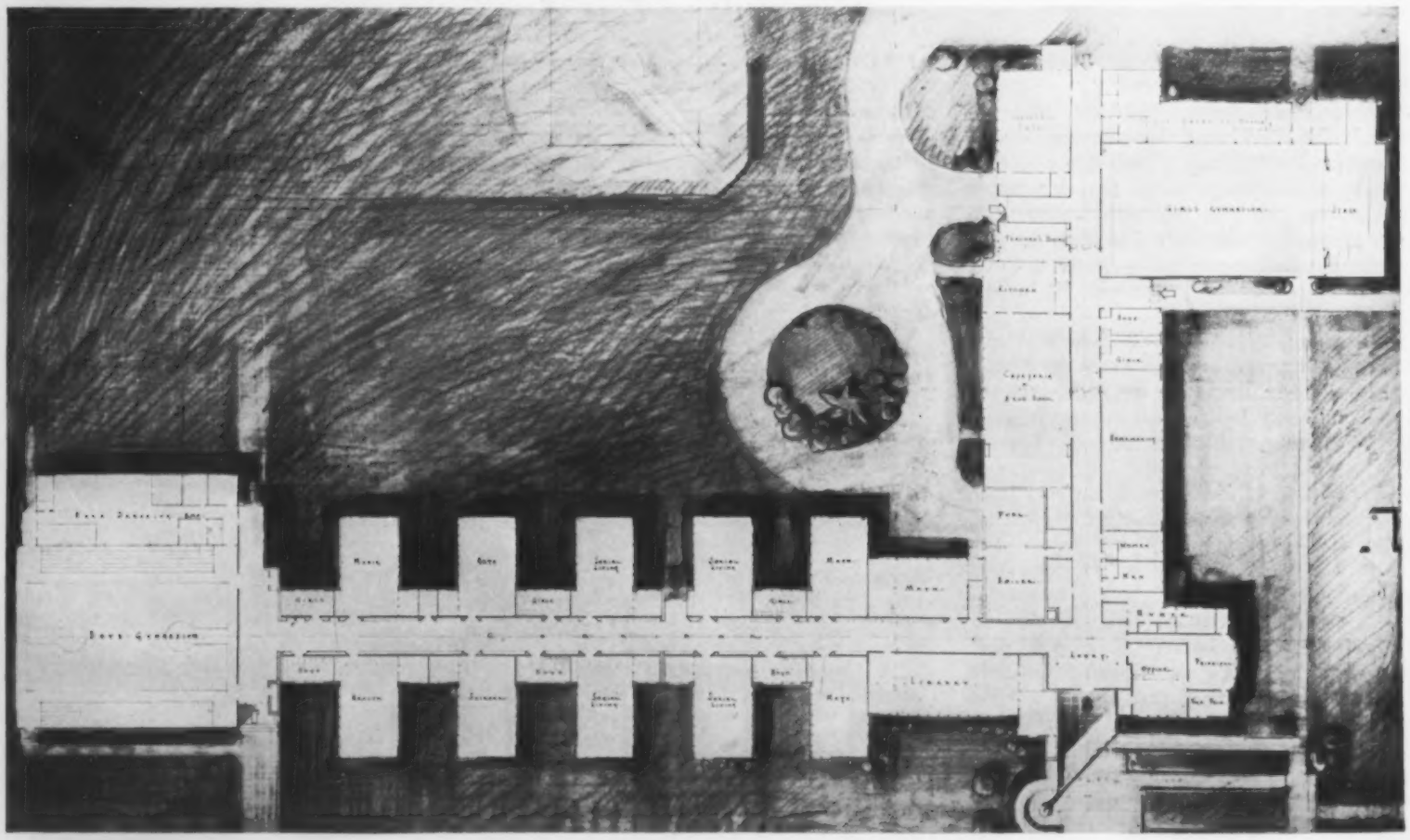
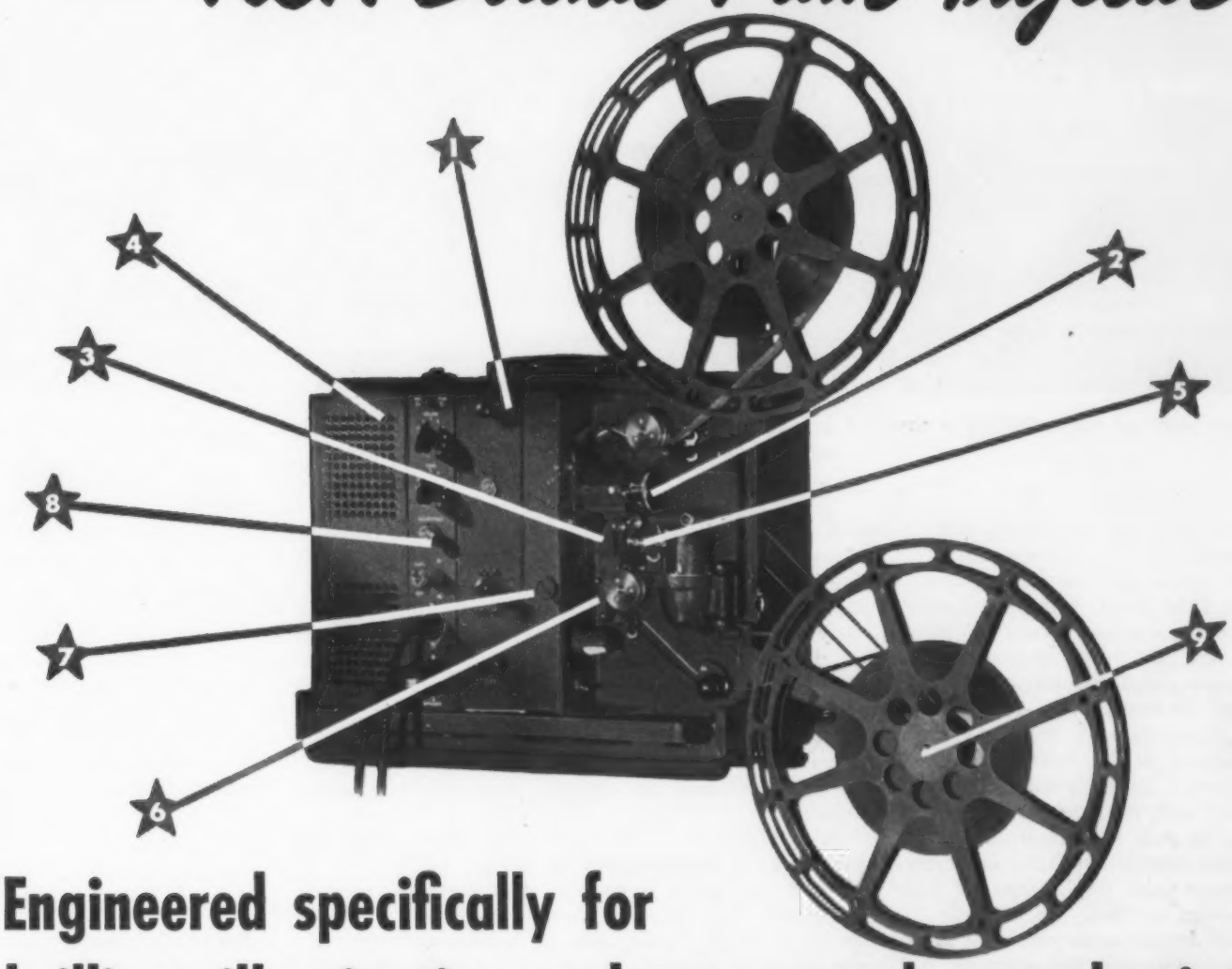


Floor plan of the Colin Kelly Junior High School, Eugene, Oregon. The main entrance and the administrative offices are located in the angle between the main wings of the building, with the classrooms at the front and back of the wing adjoining the highway. The site is ample to permit extension at the rear beyond the industrial arts shop.

NINE-STAR PERFORMANCE with the *RCA Sound Film Projector*



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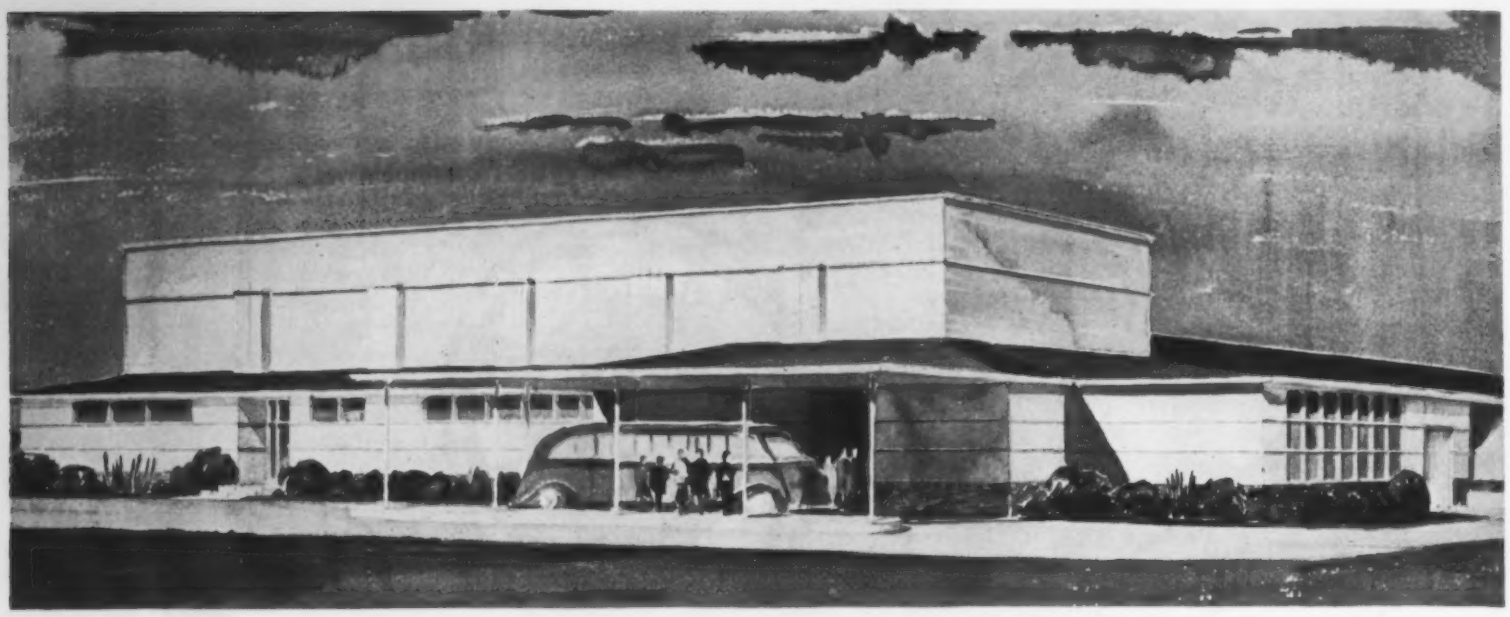

At the rear of the building a covered bus ramp permits children to leave or enter buses in comfort, an important advantage during the rainy season.

(Concluded from page 58)

facilities and their own gymnasium with the added attraction of a standard-size stage.

The large space reserved for a cafeteria "doubles" a band room, and the adjoining kitchen serves as a separate teachers' dining room. And right next to the modern administrative offices is a well-equipped nurse's suite where several students can be cared for at once.

Then, returning to the more conventional schoolrooms which nearly every present-day school affords, will be large classrooms for homemaking for girls and industrial arts for boys, excellent library facilities, boy's and girl's rest rooms, with special ones for both men and women teachers, and centrally located to provide maximum efficiency is an ultra-modern heating unit and space for fuel storage.

Since most of the 350 students attending Colin Kelly will reach the school grounds by bus, a cement-paved receiving court has been designed to handle the three 55-student capacity buses. The maximum bus route will be only six miles long, and most of the vehicles will make double trips night and morning because of the short haul.

Dr. Gunn believes that the current trend toward consolidation of school districts is closely correlated with transportation of students by bus, and this fact will mean that school districts will be enabled to build school plants where they can get plenty of land so that schools of the type of Colin Kelly, all on the ground floor, will be more and more possible.

Not the least of the advantages of the trend forecast by the Colin Kelly design is the economy to the taxpayer. This school would cost approximately 50 per cent more if constructed of hard materials, stone, cement or steel, or somewhere in the neighborhood of $450,000.

The curse of obsolescence is likewise avoided, for a school district can set up a pay-as-you-go budget plan to take care of changes and enlargement of facilities. The life of this building is standard for public buildings, Dr. Gunn points out, but historically the changes have been so revolutionary within a span of 25 to 30 years in the past that school plants built two, three and even four stories high become obsolete and sometimes unusable, and certainly much less flexible and less amenable to adjustment to meet these changes than this compact, single-story building.

School districts of the future who follow this type of educational plant design will, believes the Eugene schoolman, avoid costly, long-range bond issues required in buildings having a greater initial cost. "I believe we can get more school plant per pupil for the amount invested in Colin Kelly than ever attained in the past," Dr. Gunn holds. "If conditions required it, we could completely redesign this building within five years without a great deal of loss, something not conceivable in other type buildings. This schoolhouse is being built in a district which will most certainly greatly increase in population within the next few years, and we can add to this building similar units to the one being built now, and retain the original beauty and utility of the structure and it will not look like a patch-work quilt."

Of particular interest is this school-of-the-future to school districts where land values permit the acquisition of ample ground space to erect a spreading, homelike type of building. In cities where land costs are high, the matter of ground area is still a problem, and then it becomes necessary to go up in the air and "we should design our schools," the superintendent points out, "to take advantage of the ground space where there are available low cost school sites close to our populated areas."

From a construction standpoint the school will be no more difficult to build than a one-story home. With everything on one floor, each classroom is, in effect, a small house without interior partitions. Walls are of conventional construction and light trussed members support the roof. Since the plan has been laid out on a 4-foot module, alterations at a future date will be simple, and the use of this module will likewise simplify original construction, serving to keep down costs.

Construction work on this unusual school started in September and it is intended to complete the building for use before the coming school year is opened.

THE POSTWAR SCHOOL

(Concluded from page 45)

linowall for dadoes in place of glazed tile, wood or plaster, and various other new materials will feature the schoolhouse of the future and add cheer and comfort to our former drab classrooms.

In the mechanical services, greatly increased toilet facilities will be provided, such as group toilets on all floors, and individual toilets for all primary grades. Simplification and improvement in present heating systems will include radiant heat in all kindergartens and first grades, the harnessing of solar rays, and air conditioning. Electrical units will replace the cumbersome and expensive heating systems. New developments in fluorescent lighting tubes and fixtures, automatic electric eye for all classrooms, germ-killing lamps, wireless communication are all in the offing. Polarized glass may eventually make window shades unnecessary. Television will provide added means of mass instruction and entertainment on special occasions in the auditorium. Our postwar buildings will be planned to carry on the double function of school and community center for adult instruction and recreation, giving both children and their families opportunity for an enriched life. They should provide the nation with the needed skills and services so essential for the "atomic age" into which we are moving.

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Dr. Hobart M. Corning
Superintendent of Schools
Washington, D. C.

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School Building News

THE BIRMINGHAM POSTWAR SCHOOL-BUILDING PROGRAM

The citizens of Birmingham, Ala., on November 20, approved a $7,000,000 school-bond issue for financing an extensive postwar school-building program to provide for the construction, enlargement, alteration, and equipment of numerous school buildings, including elementary and high schools.

The present bond issue is needed to finance a postwar building program, arranged and provided for in August, 1945. This program which was recommended after an extensive study covering five sections of the city, included detailed maps showing cost, enrollment, and needs of the schools, and a summary of estimated costs for both white and Negro schools.

In the study, the present needs of each school were noted. In general, the study took into account the pupils actually in the buildings. In some cases, it included other pupils in upper grades who lived in the district but who, because of crowded conditions have been compelled to go long distances to other buildings in which there is room.

Again, a study was made with architects to find the most economical way of adding classrooms and other facilities required to meet the current need. For most of the buildings, a complete general plan was made before the first unit was constructed. In this study, however, it was necessary to see how much of the next unit was needed and could be built with the money voted.

To this study of additions to buildings and new buildings was added a survey of older buildings, with a plan for fireproofing stairways now of wood, and also for modernizing the lighting systems.

The program was printed with favorable comment in the daily papers, and neighborhood papers carried those parts of especial interest to their readers.

The board plans to call shortly for the acquisition of 22 sites and additions to sites, the fireproofing of stairways in 23 of the older buildings, modernized lighting systems in 54 buildings, and building and equipment construction in 46 buildings.

The construction program altogether will include work on 67 buildings. The program broken down into sections, provides $6,711,300 for buildings and equipment; $545,000 for new sites and additions to sites; $81,000 for the fireproofing of stairways; $268,000 for modernization of lighting systems, making a total of $7,605,900.

OAKLAND CARRIES BOND ISSUE OF $15,500,000

On October 23, 1945, the voters of Oakland, Calif., carried a school-bond issue of $15,500,000. The proceeds of the bonds will be used in financing an extensive school-building program, involving repairs and replacements, modernization, safety features, and new buildings.

The success of the bond-issue proposition was due largely to a fine program of publicity carried out by the school authorities, which included speeches by bond campaign speakers, and a program of publicity material presented to the school patrons and citizens. The campaign talks were limited to ten minutes and during this time the speaker gave a quick, effective presentation of the building needs and facts to support his points.

In all the publicity material, attention was called to the fact that Oakland is a growing city, since it is the center of a rapidly growing industrial area and the natural port for a vast region of back country. It is also the terminal of the most direct rail route to the East.

In pointing to the great need for schoolhousing, attention was called to the fact that since 1924, the date of the last school-building program, the establishment of schools and modernization have not kept pace with the city's growth so that the need has become acute. To date, 24.6 per cent of the elementary classrooms are in portable buildings, and 38 per cent of the elementary classrooms are in portables or obsolete buildings. Of the high school buildings, 28 per cent are in portables and 5.3 per cent are in obsolete buildings. Portable buildings are also being used in recently developed and new school units. In some areas from 50 to 100 per cent are housed in portable buildings.

There appears to be a need for new and modern equipment. Much of the classroom equipment of the schools is over twenty years old. Improvements in seating equipment are needed to keep up to the present modern standards. Most of the shop equipment is old and in need of replacement.

A good many of the buildings are lacking in safety features. Of the 116 buildings used for school purposes, 65 are over twenty years old, and thirty buildings are over thirty years old, of which only two have been modernized.

Preceding the building campaign, careful studies were made of population trends in each area of the city. Factors which determine the growth of population and shifts from one part of the city to another were studied, and were taken into account in placing new school buildings.

The publicity work was carried out with the aid of a large group of citizens, civic agencies, and industrial concerns who were willing to share their ideas and future plans with the school officials. Population studies, including birth rates, migration, transportation, housing, shifts in real estate prices, and employment opportunities, all were studied in connection with the

(Concluded on page 66)

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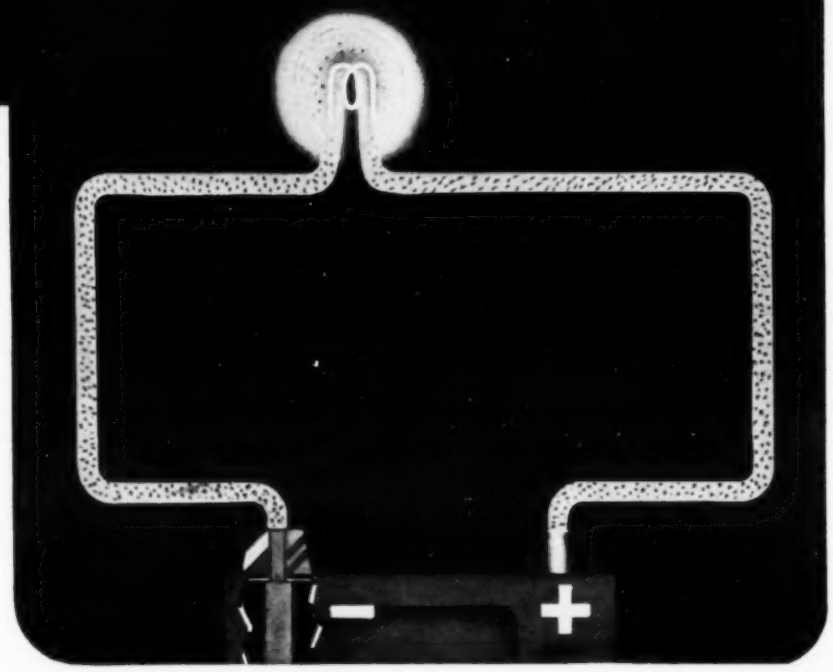

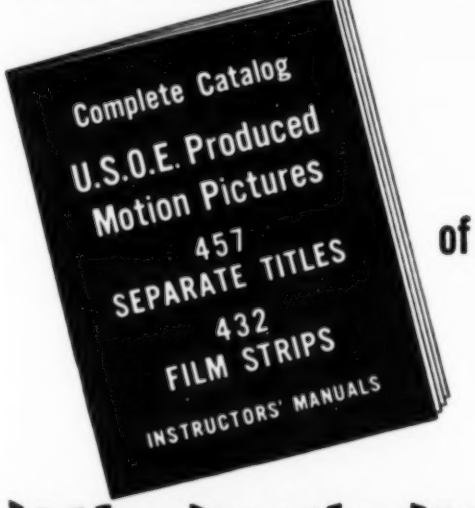

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School Building News

(Concluded from page 64)

project. A number of individuals and business concerns in the city gave practical demonstrations of co-operative community effort and demonstrated their interest in the welfare of the schools.

The building program provides for the meeting of immediate needs where factors are known and conditions are stable as regards population trends, community development, and other matters affecting school requirements. A repairs and improvement program will be undertaken out of current school funds, which is possible because bond funds will release current income set aside for current building purposes.

The total amount of the bonds will amount to $15,432,000 and the bonds will run for 25 years, payable in 24 equal installments.

BUILDING NEWS

► Westfield, Mass. The school board has approved plans for alterations, repairs, and changes in eight school buildings, amounting to a total cost of $42,000. The changes have become necessary after a survey revealed serious dangers in safety and sanitation.

► Racine, Wis. The school board has asked the city council for permission to establish a $100,000 building reserve fund for the future school buildings. The board, which acted under authority of a state statute, asked the council to set up the amount in the 1946 budget. The fund, together with additional money to be raised in succeeding years, will be used to build new school buildings.

► Artesia, Calif. The board of education has begun plans for a school-building program to include two additional wings to the Clifton Primary School. The board has $100,000 on hand for building purposes but some help must be obtained from state and federal sources. The new schoolhousing program has become necessary due to a rapid increase in the school enrollment. At present, the district has 49 per cent of its pupils on double sessions, and there is indication that there will be a continued and rapid growth during the next few years.

► The voters of Bucks County, Pa., have approved a school-bond issue of $500,000 for the erection of a joint high school building. From 65 to 90 per cent of all the voters in the districts involved approved the program.

In the Langhorne-Middletown joint school district, bond issues were approved for the construction of a $150,000 addition to the high school.

► Bradley, Ill. The board of education has begun plans for the construction of a new high school plant, including a gymnasium. A new football field and track will shortly be completed. Plans have been completed for alterations to the gymnasium at the Bradley grade school.

► The New York City board of education is planning to allot $1,250,000 for the construction of a new central supply depository for its Bureau of Supplies, to replace the present leased quarters, which have proved inadequate.

The Bureau now maintains a depository in leased quarters on 72nd Street, which has been offered for sale for $800,000. A new building would concentrate all units of the Bureau, including the supplies headquarters, under one roof, and effect an annual saving of approximately $118,000.

► North Andover, Mass. Following a survey of school-building conditions and requirements for the city schools, Messrs. Griffenhagen & Associates, Washington, D. C., have recommended a 25-year school-building and financing program. The new program will involve an almost complete replacement of the present physical plant on a modified pay-as-you-go plan of financing.

► Parma, Ohio. Gerald E. Irons, commissioner of buildings for the Cleveland Board of Education, has been retained by the Parma Board of Education to make a study of the schoolhousing needs of Parma for the next ten years.

An expanded program of education and recreation, sponsored jointly by the school board and the city, has been planned with a six-point program:

1. Industrial-arts courses to develop skills of lifelong usefulness
2. Modern science equipment to provide a better science background for jobs and for college
3. Expansion of commercial education
4. Art courses in all schools (now only in junior high school)
5. Fair salaries for teachers; and
6. A summer recreational program

Mr. Carl C. Byers who is superintendent of schools, came to Parma in 1942 from Gallipolis, Ohio, where he was principal of the Gallia Academy High School. He was recently appointed superintendent for five years. The survey being conducted by Mr. Irons will chart population trends in the Parma district, with spot maps showing where the present pupils live and the location of the new homes built in the past five years. Population has increased from 16,000 to an estimated 25,000 since 1940.

PROPOSE MEMORIAL RECREATION PARK

The board of education of Port Huron, Mich., has adopted a program calling for a memorial recreation park, to include a club house, softball and hardball diamonds, football fields, running track, stadium, tennis courts, wading pool, picnic tables, band shell, and horseshoe courts. The entire project will cost an estimated $250,000.

The plan of the park and its included facilities and cost estimation were presented by a committee representing 33 interested organizations sponsoring the campaign. Other organizations and the district are aiding in the campaign which will begin May 3, 1946. Funds raised by the Memorial Recreation Park Committee will augment funds now in the Port Huron District Foundation.

PREFABRICATED SCHOOL BUILDINGS: AN ENGLISH VIEW

The seriousness of the school-building shortage and of the lack of construction materials in England is causing local education authorities in that country to seek methods of construction which will provide suitable housing with a new and substitute material in the shortest possible time. The use of prefabricated units is proposed as one means of solving the problem in part, or at least for some years to come.

The advantages, as well as the shortcomings, of prefabricated school units are outlined in a "survey" presented in the London *Times Educational Supplement* as follows:

What Prefabrication Is?

At the present time the phrase "unorthodox methods of building" is synonymous with "prefabrication." Prefabrication can be defined as the manufacture of units or components — walls, floors, roofs — elsewhere than in their final position on the site and in such a way that the amount of labour required on the site is reduced. The reduction in site labour is the critical factor in prefabrication and the degree to which a building can be prefabricated can be roughly measured by this. Many authorities are eager and anxious to know how far such methods of construction can be applied to school building, how suitable they are, and what chance there is of obtaining these units. They wish to know how permanent such methods of construction are — how long they may be expected to last without excessive maintenance, how much they will cost in relation to orthodox methods, and what materials and methods are the most suitable.

So far the Ministry of Education has given little help in this problem and the report on the Construction of School Buildings was mainly concerned with the problems which would arise in planning and the use of 8 ft. module or grid. It gave no information on the urgent and important problems of cost and length of life. The Ministry were wise to be unhelpful. Questions of cost, of permanence, depend upon the availability of materials and labour, and even at this stage it is still impossible to formulate a definite programme.

Most authorities will have used the "army hut" — that small-windowed box which has been supplied by the departments for all purposes from hostels to hospitals, from day nurseries to canteens. Usually of a precast concrete frame with various types of infilling slabs, brick, sawdust cement or clinker, it is a standardized building which has been serviceable during the war. In its present form it is utterly unsuitable for school building and will comply with none of the recommendations which have been made in regard to such matters as day lighting and thermal insulation. . . .

The standard concrete hut has been instanced as a warning against the adoption of prefabricated methods of construction simply because they are available. In itself, for the set of conditions in which it is designed to operate, the concrete hut has proved efficient enough, but it has not been designed to meet the special and exacting conditions of school use. The same applies to a greater or less degree to other methods of prefabrication.

Most of these have been designed for the special need of house construction and are not primarily intended for schools. The publication of the British Standards and Codes of Practice relating to the design and construction of schools set new and improved standards, and it is essential they should be adopted at the outset of our national task. If it were decided, as a matter of policy, that all systems of prefabrication, if they are to be adopted for school purposes, must conform to these standards there would be small danger of substandard or unsuitable buildings being thrust upon us during the next few years. They should apply to both permanent and temporary school buildings regardless of their construction. These standards will increase the cost of building of all types of construction but to allow relaxation in standards for the temporary or the prefabricated types will vitiate the effect of these standards.

Problems of School Design

Although scores of prefabricated houses of different construction have been erected in the last two years, there has been no continuous experiment with the special problems of school design. For this reason alone the erection of schools is likely to lag behind other developments and to diminish the chance of an allocation of materials commensurate with the demand while making it more difficult to reject the standard hut when it is offered. Some systems have already been brought to a high degree of finality for permanent house construction and among them are some which might easily be adapted for school purposes.

School building is fundamentally different from house construction in that only one school is required in one place. While a small town may require several hundred houses in one estate, only one or two new schools will be required. The school is thus a more isolated unit, and transport, the use of skilled labour, and so on will be larger items. It is high time that the Ministry of Education undertook or even encouraged the erection of a number of schools of different kinds, in different areas, employing different methods of construction. At the same time a number of others, using orthodox methods, should be built so as to function as "controls." Both groups

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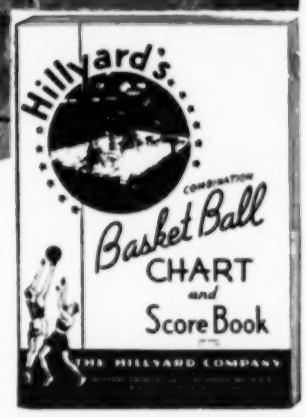

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should be built in accordance with the standards laid down in the new Education Act and the standards of codes and practice.

The extent to which prefabricated methods of construction can be applied to school building could also be examined in this way. It is obvious that such methods cannot be readily applied to special buildings or those which are not common to most schools. In the report previously referred to it is evident that the committee reporting to the Ministry of Education had considered this problem. It is obvious that the classroom, whose size is now generally uniform, and for which standards of illumination and ventilation have now been issued, is a most suitable part of the plan for this purpose. The new Act will increase the number of classrooms required, particularly as a progressive reduction in the size of classes is proposed. The construction of prefabricated classrooms would make it a simple matter to add to their number where space was available and to alter, re-design, or supply new surfacing materials when required. This is an important point, as it is likely that substitute finishes will have to be employed in the next few years.

The problem is different where lack of space compels two floors of classrooms and for such specialist classrooms as the domestic science rooms and laboratories. With classrooms on two floors the provisions in the new regulations for ensuring an adequate degree of fire resistance and for floor loadings are so much higher than in the case of houses as to make a light construction less practicable. It can be done, but it seems unlikely to carry with it any definite advantages. In the specialized classrooms, where heavy equipment, special floor and wall coverings such as tiling in the domestic science room, and appliances like sinks and cookers are required, the difficulties which arise in fixing, and in the installation of special drainage service elements, make them less suitable for prefabricated construction. Such installations are expensive in themselves, and it is convenient that they should be housed in buildings of orthodox construction. For the same reason lavatories and cloak rooms are likely to be built in this way, and as these buildings usually encounter very severe conditions of use, the maintenance costs must be considered. The same will also apply to kitchens.

School and Community

In considering the application of prefabrication to other parts of the buildings, it is essential to consider the relation of the school to the community, and the importance of good design in the education of the child. Schools made up of standard constructional units can only have a limited individuality and with age their appearance will not be enhanced. A school has a permanent influence on the community and this must be reflected in the design of the buildings. Buildings of a poor character, without dignity both of siting and material are less likely to provide an affective background to education and to the new importance it must possess in our national life.

The assembly hall, the lecture room, the library, and other accommodation the function of which is cultural and which form the core of the school's communal life, are probably better built by orthodox constructional methods. Buildings like the assembly hall and the gymnasium need not be postponed by shortages of permanent materials. The frame, always necessary in buildings of this span, can be of permanent construction, while less permanent and even frankly temporary materials can be attached to it until the supply of permanent materials becomes less critical. There are, indeed, many methods of overcoming such difficulties which will suggest themselves to experienced architects, but these stratagems will also be used in housing, and a two-stage building operation of this sort is costly.

This survey of the extent to which prefabrication can be applied to school building may appear disappointing and to suggest that there is only a limited hope of providing schools by these means. But if the classrooms alone were prefabricated in half the schools which it is necessary to build in the next 10 years, the saving in building labour would be enormous and education would profit rather than lose by the arrangement. For a standard classroom can take advantage of modern production methods to include equipment and fittings which will be impossible in individual schools, and by planning in advance for quantity building erection costs will be continually reduced. Prefabricated methods are still in their infancy and will probably be immensely developed in the future.

But steady improvement in school design and an accompanying reduction in building costs is only possible on a secure and well-established programme of building. Such a programme must depend upon a detailed and accurate survey of the educational needs of the country as a whole and upon an estimate of the volume of school building which will be necessary. At the same time experiments must be made in building methods, and the results must be carefully checked and disseminated. It is a task of considerable magnitude and essential to the success of the Act, to the well-being of the country.

LOUISIANA SCHOOL DISTRICTS

Through an error, an editor's note in the December issue of the Journal declared that there are only two independent school districts in Louisiana. The cities of New Orleans, Monroe, Lake Charles, and Bogalusa are independent. Baton Rouge is a part of the East Baton Rouge parish school system.

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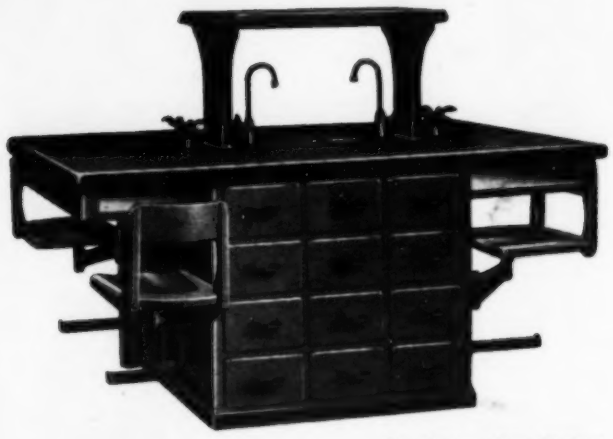

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School Law

Teachers

Where a teacher had served regularly and continuously as a substitute teacher for two school years, and in her third year she terminated her employment by resigning over a month before the end of the school year, she thereby interrupted the statutory three-year probationary period, and her tenure was not protected thereafter. G. L. (terr. ed.), c. 71, §§ 41, 42. — *Nester* v. *School Committee of Fall River*, 62 Northeastern reporter 2d 664, Mass.

A board of education had the right to specify in a contract with a woman teacher that the contract would be terminated in the event of a teacher's marriage during the term. — *Board of Education* v. *Taylor*, 16 Ohio Supp. 146, Ohio Com. Pl.

A provision of the Ohio Teachers' Tenure Act that a continuing contract shall be entered into by each board of education with each teacher holding a professional, permanent, or life certificate, who has completed five or more years of consecutive employment by the board, is an offer to the teacher and a fulfillment of statutory requirements by the teacher constitutes such an acceptance thereof as imposes on the board a mandatory duty to enter into such a contract. Ohio general code, §§ 7690–1 *et seq.*, 7690–2, 7690–3 (119 Ohio laws, p. 452 *et seq.*); Ohio general code, 7896-34. — *Roller v. Patrick*, 62 Northeastern reporter 2d 367, 145 Ohio St. 572.

Under the New York Education Law, a high school teacher against whom a superintendent of schools has preferred charges of incompetent and inefficient service may properly be suspended without pay, from the time charges are preferred until determination thereof, notwithstanding that there may be intervening meetings of the board of education. Administrative Code, 884-1.0; N. Y. Education Law, 868, subds. 9, 10a, 15; § 870, subd. 4; § 872, subds. 3b, 3c. — *Wolf* v. *Board of Education of City of New York*, 57 N.Y.S. 2d 63, 184 Misc. 890.

School District Government

The board of education of a town in the maintenance and management of public schools is the agent of the state and not of the town and to that end is granted broad powers by the Connecticut legislature. — *City of New Haven* v. *Town of Torrington*, 43 Atlantic reporter 2d 455, 132 Conn. 194.

School directors who deposited school district funds in a trust company without obtaining the required security were liable to surcharge by the auditors required to audit school finances. 24 P. S. §§ 2201-2216. — *In re Cochran*, 43 Atlantic reporter 2d 84, 352 Pa. 538.

A school district has the power to provide adequate facilities for physical education, including the erection of a stadium, and may finance the construction of these facilities in the same manner as the acquisition of a school site, or the erection of a schoolhouse thereon, such as by the issuance of bonds for that purpose. Smith-Hurd statutes, s. 122, §§ 136a, 322, 339, 532.1 to 523.5. — *Moyer* v. *Board of Ed. of School Dist. No.* 186, 62 Northeastern reporter 2d 802, Ill.

School District Taxation

A will providing for the establishment of an "industrial school" for education in arts and sciences, with Bible teachings a prominent feature, and providing that the school be Protestant in ethics and teachings but otherwise undenominational, and should not exclude those of other faiths, manifested an intent to establish a sectarian Protestant School, and hence a village could not issue bonds or expend funds raised by taxation for support thereof as required by the will. Ohio constitution, art. 1, § 7; art. 6, § 2. — *Findley v. City of Conneaut*, 62 Northeastern reporter 2d 318, Ohio.

Pupils

In the absence of a statute to that effect, a board of trustees is not required to call for bids before it enters into a contract with a private carrier for transportation of pupils. Mont. revised codes of 1935, § 1016; Mont. laws of 1941, c. 152, §§ 1,5,15. — *In re Transportation of School Children*, 161 Pacific reporter 2d 901, Mont.

The Small School District

The complications which arise from the exceedingly small school districts in the Middle West are well illustrated in School District 404, Wayne County, Neb. In November, 1945, the district had only four legal voters and three of these were officers. One of these, the treasurer, refused to act any further. Unless the fourth voter could be persuaded to receive an appointment as treasurer, the school district must be discontinued and the school must close for lack of legal organization.

NEWS OF SCHOOL OFFICIALS

► Frank S. Lancaster has been elected president of the school board at Lebanon, Ky., to succeed the late W. P. Myers. George E. Kelly was named vice-president.

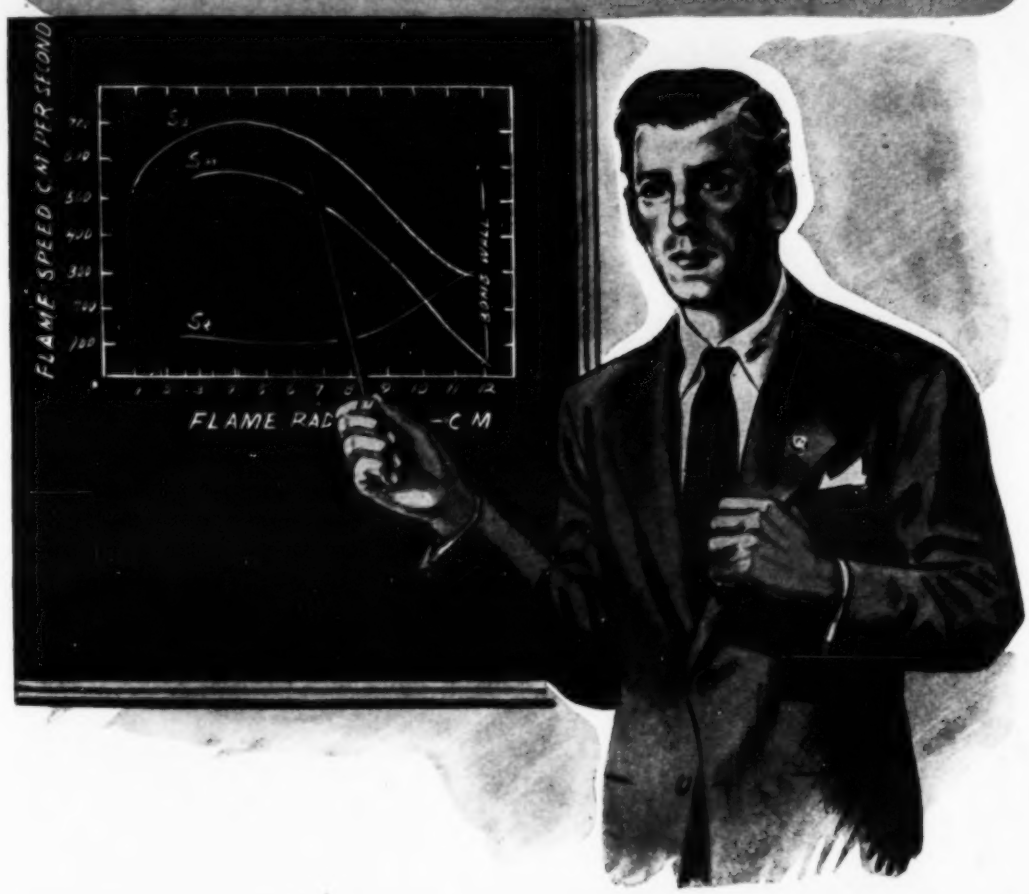
► Earl H. Beling, president of the school board of Moline, Ill., has been elected president of the Illinois Association of School Boards.

► Robert E. Shoens has been elected a member of the school board at Dearborn, Mich.

► J. Harold Stewart, president of the school board at Blair, Neb., died suddenly on October 25.

► Mr. Clare R. Sperry has been appointed a member of the board of education of Port Huron, Mich., to succeed James R. Wellman.

HE MADE MEN... OUT OF BOYS!



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Teachers' Salaries

KEENE TEACHERS' SALARY SCHEDULE

The board of education of the Union School District of Keene, N. H., has adopted a new salary schedule, which divides teachers into two groups and allows compensation on the basis of the experience and professional training of the teachers. All salaries begin in September of each year and payment is to be made semimonthly for a period of 12 months.

Under the schedule, Class A teachers are divided into three groups, namely, teachers with master's degrees, those with bachelor's degrees, and those with no degrees. Teachers in Class B are similarly divided. Teachers with a master's degree will begin at a minimum of $1,200 and will be given annual increments of $100 up to a maximum of $2,400; those with a bachelor's degree will be given the minimum salary, with increments of $100 up to a maximum of $2,200; those with no degree will be given the minimum with increments of $75 up to a maximum of $1,750.

Teachers in Class B, who hold a master's degree will begin at $1,200, with annual increments of $100 up to the maximum of $2,000; those with a bachelor's degree will be given the minimum of $1,200, with annual increments of $100 up to the maximum of $2,000; those with no degree will be given the minimum and increments of $75 up to the maximum of $1,650.

All new teachers are required to hold a bachelor's degree from a college or university, with the exception of teachers in the mechanic arts courses, who must have not less than two years' experience in a trade.

All teachers in the school system on June 1, 1946, will be classified on the basis of efficiency according to the recommended classification, A or B, and will come under the subdivision classification according to education.

A teacher to become eligible for an elementary school principalship must be classified Class A. The sum of the $100 renumeration will be paid annually for this position.

A male teacher, living with wife who is not gainfully employed, will be allowed the sum of $400 for the wife. Similarly, any female teacher, solely responsible for the support of a husband who is incapacitated, will be allowed the sum of $400 for his support. A male or female teacher, or a widowed teacher, will be allowed the sum of $200 for each child living at home and not gainfully employed, or who is under the age of 18.

All teachers will be allowed a leave of absence once every seven years for a period not to exceed six months, at one half salary. Application for such leaves must be made in writing to the superintendent.

Any teacher in the system on June 1, 1946, who has no degree, will be allowed a sum not to exceed $100 annually for approved summer school work.

No teacher employed on June 1, 1946, will suffer any decrease in salary from the schedule in effect, nor lose any rights to permanent tenure in effect on that date. After July 1, 1950, all teachers will be paid under the schedule and receive the contract provided by the manual. Teachers who on July 1, 1950, have faithfully served the district for 15 years or more, but who do not have the necessary educational qualification, will be classified A2 or B2 and will not be required to meet additional educational qualifications. Fifteen or more years of service will be considered the equivalent of a bachelor's degree. A teacher classified A1 on July 1, 1950, but who was receiving on July 1, 1946, a salary greater than the maximum specified, will not be penalized by a reduction.

No members of the teaching staff will be permitted to work for hire at any position from September 1 through June 15. They may work during the summer vacation period, but it is desired that teachers take the vacation period for rest and further education.

All teachers with three years' service are eligible to participate in the state retirement program, and will be required to pay 4 per cent of their salary as a fee annually. All teachers are eligible to participate in the sick leave and extended leave for personal illness. To be eligible for the extended leave privileges a teacher must have completed five years of service.

MILWAUKEE ADJUSTS SCHEDULES

► Milwaukee, Wis. The board of school directors has approved new wage and salary schedules set up by the county technical committee. The graduated schedules, which will allow most employees to work toward higher maximum salaries, and some to start at higher minimums, will affect 2400 school employees, and cost $64,237 more annually when placed in effect January 1, 1946. These, in brief, are the provisions:

Substitute Teachers. Recognizes master's degrees with 50 cents additional per day. Those on "A" list get up to $9.50.

Teachers, Teacher-Librarians and Welfare Workers. Division A (without degrees), no change. Division B (with bachelor's degree or board approved equivalent), former minimum, $1,400; to get from $1,600 to $2,800. Division C (with master's degree or equivalent), former range, $1,500 to $3,000; new, $1,700 to $3,100.

Vice-Principals. Elementary schools, maximum raised from $3,100 to $3,200. Junior high, former range, $3,100 to $3,300, raised to $3,200 to $3,600. Junior trade, moved from elementary range, to junior high. Senior high, raised from $3,900 to $4,000.

Principals. Elementary, Group A, former range from $3,200 to $3,800, raised to $3,500 to $3,900. Group B, former range, $3,900 to $4,400, raised to $4,000 to $4,500. Junior trade schools, same. Orthopedic school, changed from elementary to junior trade scale. Junior high, minimum lowered from $4,520 to $4,200, maximum raised from $5,000 to $5,100. Senior high, former range from $4,520 to $5,000, with bonuses in proportion to enrollment, to range from $4,500 to $5,400, without such bonuses.

Central Office Administrative and Supervisory Staff. Supervising teacher, $2,400 to $3,600; assistant supervisor, $2,800 to $4,000; supervisor, $3,300 to $4,800; department director, $3,800 to $5,000; assistant to superintendent, $5,000 to $6,000; assistant superintendents, $5,500 to $6,500. Because of reclassification of the staff it is difficult to compare new and old schedules.

Per Session Employees in the Department of Recreation and Adult Education. Per Diem Employees, with minimum eight hour days, are to advance from a $5–$8.50 range to $6–$9.50 in Class A and from $5–$7 to $5–$9 in Class B. Recreation instructor (V) will advance from $1,320–$2,310 range to $1,600–$2,800. Social center directors who received from $2,400 to $3,500 in three classes will get from $2,700 to $3,600 in two classes.

Classified Employees. The same basic pay range adopted for others governmental units.

Engineer Janitors. Now average a 55-hour week. Will receive the same salaries in three classes, but on a 44-hour week, with compensatory time off for long hours served in cold weather.

Playground Employees. Custodians, from $130–$155 range to $140–$165; hourly help, unchanged.

Secretary-Business Manager. Now $6,500, to advance to $6,750 Jan. 1; to $7,000 July 1, then by annual increments of $250 each to $7,500.

Paid vacations will be granted to part-time employees engaged for more than 1000 hours.

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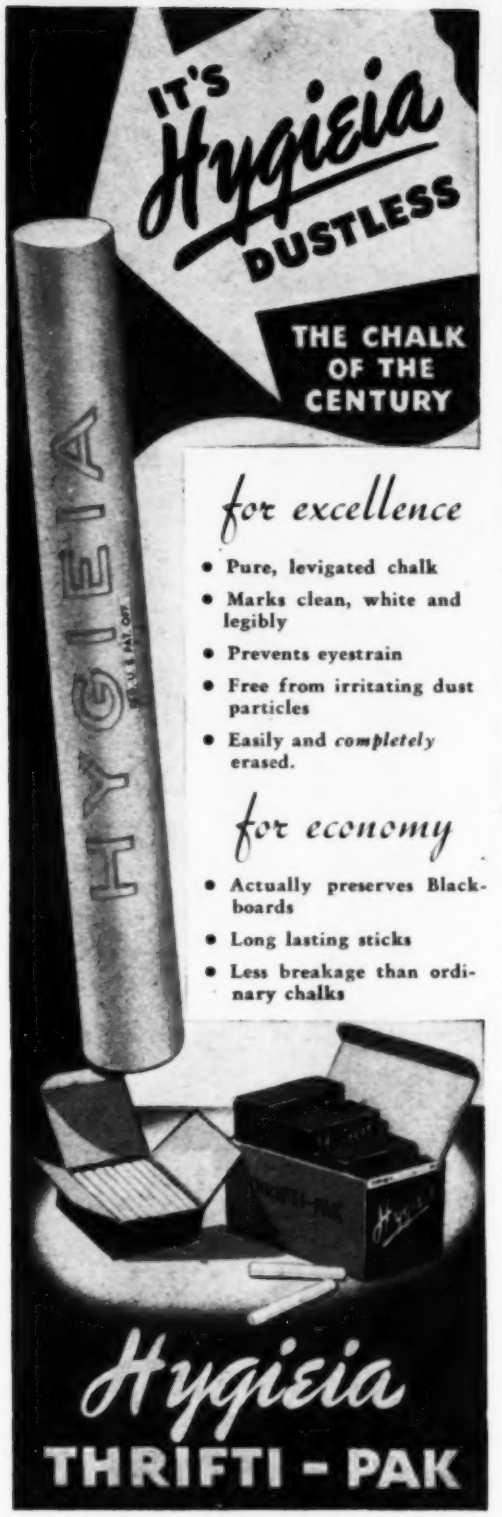

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School Administration in Action

CONSERVATION OF HEARING IN SCHOOL CHILDREN

Defective hearing is impaired health. Deafness and impaired hearing are major problems of public education, public health, and preventive medicine.

A joint committee on health of the National Education Association and the American Medical Association recently adopted a statement on the detection of defective hearing in school children and the means for discovering such defect.

The three most commonly used procedures for finding children with impaired hearing, according to the committee, are the voice, the watch, and the audiometric tests. Development of the audiometer for measuring hearing acuity has made possible more accurate testing than could be done by the voice, the watch tick, or tuning fork. The phonograph audiometer is now being used in schools for screening purposes. Pupils suspected of having hearing defects are retested by a pure tone or pitch-range audiometer and those with significant losses are referred to a physician, preferably an otologist. The limitations of the phonograph audiometer are that it does not disclose losses for the higher frequencies and it cannot be used in testing pupils too young to write numbers. A pure tone audiometer, it is found, is preferable for testing school children of all ages.

After testing, a follow-up program is started. When a hard-of-hearing child is found, the parents are notified and arrangements made for referral to the family physician or otologist for treatment.

It is suggested that deaf and hard-of-hearing pupils have their school programs modified. They may be assigned to special schools or classes for the deafened, to special classes for the hard-of-hearing. Whenever possible, the programs should be adjusted in the regular classroom. To compensate for defective hearing, attention should be given to lip reading, speech correction, social adjustment, vocational training, and occupational placement.

REORGANIZATION OF THE CALIFORNIA STATE DEPARTMENT OF EDUCATION

The California State Board of Education, at a meeting held in October, 1945, upon recommendation of the State Department of Public Instruction, effected a reorganization by consolidating administration of the various functions and services of the Department into six divisions. Five new divisions were established, including a Division of Departmental Administration; a Division of Public School Organization, Administration, and Finance; a Division of State Special Schools and Services. The sixth division is the Division of Libraries. Previously established divisions, with the exception of the Division of Schoolhouse Planning, have been discontinued and their functions and services are incorporated in the new divisions.

SOMERVILLE INAUGURATES PROGRAM OF BUILDINGS AND REPAIRS

During the school year of 1944-45, the building commissioner of the board of education at Somerville, Mass., has done a creditable job in the repair, maintenance, and improvement of the 27 school buildings while faced with wartime stortages of materials and man power. He has co-operated with the school department in an effort to make the school buildings safe and comfortable for the children.

During the year, a program of repairs and improvements was carried out, beginning with the Western Junior High School. The work included new ceilings, new window shades, a loud-speaking system, improvements to the heating, plant, and new ceiling lights in the auditorium.

At the senior high school improvements were made to the heating plant, the lights in the gymnasium, corridors, and cafeteria were repaired, and the cafeteria refrigerator was reconditioned.

Other substantial improvements were the installation of new boilers in two schools, a new concrete floor in the Glines School, new partitions in the sanitaries, and improvements to the kindergarten.

Special attention was given to the repair of panic bolts and door checks in buildings and to the replacement of glass. Furniture and doors were repaired in 12 buildings. General plumbing and heating repairs were made in all buildings, and seats were painted in the sanitaries of 14 buildings.

TELLS PARENTS OF KINDERGARTNERS WHAT TO EXPECT

Carteret, N. J., public school system has recently published a 14-page booklet, "Helping Your Child to Get a Good Start in School," which is sent to parents of all kindergarten pupils. It was written by Supervising Principal George S. Goodell, and Miss Katherine Donovan, principal of Washington School, with Miss Anne Richards, principal of Cleveland School, contributing. The cover was designed by Miss Agnes Gundersen, special teacher of art. The booklets were mimeographed as a class exercise by the "office practice" class of Mr. Frank Bareford, at the high school.

The need for a guide for parents of little children who are being inducted into the mystries of school was seen by Mr. Goodell and Miss Donovan, and it was with this need in mind that this blueprint of the child's first contact with school was prepared. It explains to the parent just what the kindergarten will do for his youngster. The child's development, his increasing sense of responsibility, and his new experiences are described.

Also, the duties of the parent in making his child's start in school life a success are put squarely up to him. The essentials of proper attitude and personal habits; of the symptoms of illness which should be a cause for keeping pupils home; periods of exclusion for various diseases; visits to school by parents; and how complaints may be registered, are all cited. The health habits, and care of the child are listed.

The attitude of the parent is stressed — his confidence in the teacher, his visits to the school and attendance at PTA meetings, and interest in the child's report card, and the changes that have taken place in primary schools since a generation ago, are cited.

The booklet explains the need of the school for understanding and help at home. Only by co-operation of the home with the school, will the child's interests be served.

VISUAL AIDS IN AKRON SCHOOLS

The 56 school buildings of Akron, Ohio, under the direction of Mr. M. Lincoln Miller, director of visual aids, have been provided with one or more sound motion-picture projectors each.

To facilitate the use of visual aids and make the program more effective, a visual-aids coordinator has been employed in each school. Regular departmental meetings are held, and a monthly news bulletin is published.

In the Central High School, a point system has been set up for student awards and school letters are awarded for visual-aids service. In all schools, student projectionists carry printed operator's permits.

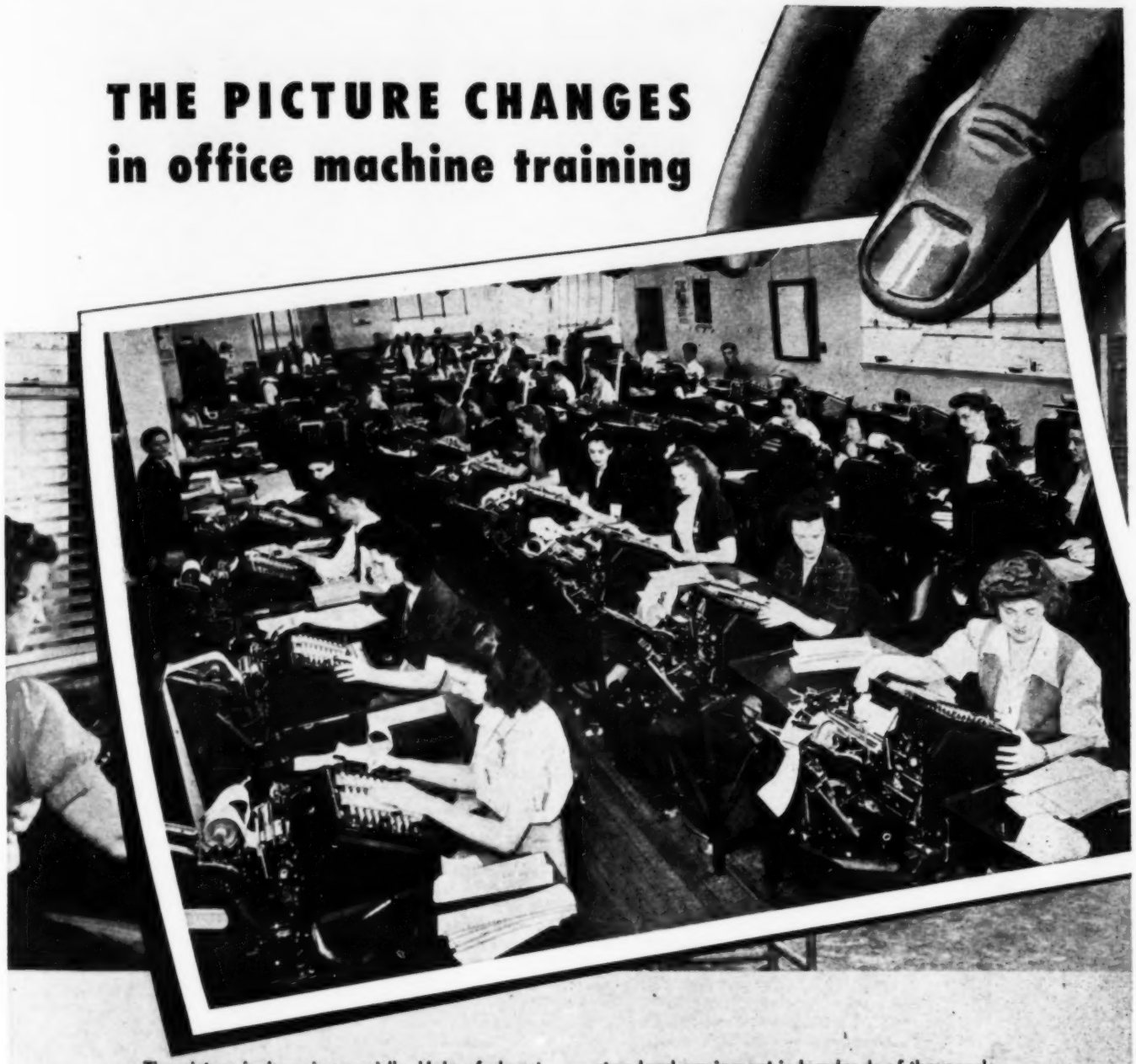
The school film library directed by Mr. M. Lincoln Miller, renders extensive service to the community. Twenty-four community organizations are regular borrowers of the films.

Enlarged offices, workrooms, and a screening room have been provided for the radio and visual aids departments. The radio department is under the direction of Mrs. Josephine French, and the visual aids under the direction of Mr. Miller.

SCHOOL LAW

Attorney General Eldon S. Dummit of Frankfort, Ky., has ruled that County Judge John Matt Pursifull exceeded his authority in excusing children from school to work for their own support. He pointed out that the board is permitted in certain instances to issue work permits to 14 to 16-year-old pupils, exempting them from compulsory school attendance.

THE PICTURE CHANGES
in office machine training



The picture is changing rapidly. Help of almost any kind at almost any price—the employer's need in war—gives way to the ever-growing peacetime need for better trained employees in every branch of business.

This changing picture presents schools everywhere with their greatest opportunity. Students have more time for better training; employers want them to have that better training—want them to be more highly skilled specialists in the peacetime arts of business.

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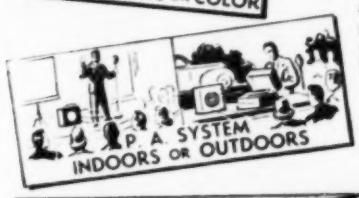

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INDIANA CONFERENCE ON PUPIL TRANSPORTATION

School superintendents, educators, and community leaders were in attendance at the two-day conference on pupil transportation, held at Indiana University, in Bloomington, November 12 and 13, 1945. Dr. Harold E. Moore, director of the University Bureau of Teacher Recommendations, was in charge.

Educators from the state were present to speak on school problems, as well as four guest speakers, including Dr. Howard A. Dawson, of Washington; Dr. Clayton D. Hutchins, of Washington; Mr. Norman E. Borgerson, of Lansing, Mich.; and Mr. Burley V. Bechdolt, of Indianapolis.

Speaking on the topic, "The Welfare of Rural School Children in Transportation," Dr. Clayton D. Hutchins pointed out that good transportation service that is regular and dependable has important public-relations value. Excellent school administration in rural areas demands a school transportation system that is safe, efficient, and economical. He urged that in some states and counties the transportation service be extended and improved.

Dr. Howard A. Dawson, speaking on the subject, "Social and Economic Backgrounds of Rural Education," said that rural schools with few exceptions are in need of far more adequate and efficient administrative services and organization. For the most part rural schools, he said, are in administrative units too small to afford adequate service.

Dr. Burley V. Bechdolt, speaking on "Transportation Costs," said that in any fair comparison of expenditures of school cities and towns with those of townships, transportation should be excluded. This is an additional cost that must be met over and above the cost of educational facilities and services. He pointed out that Indiana school cities and towns spend only 43 cents per pupil more for operating expenses than do the townships, but that school cities spend $22.77 more per pupil for instruction than do the townships. Indiana school cities and towns on the average, he said, have far more wealth per pupil than do the townships, but the townships must expend one fourth more per pupil than the school cities in order to provide equal educational opportunity.

Mr. Norman E. Borgerson, speaking on "Mobilizing the Forces for Rural Living," emphasized that all community institutions must be built up to take their full responsibility in the lives of the citizens of the community. He said that the development of the community school must go hand in hand with other resources for better rural living.

Mention was made of a state-wide study of pupil transportation, now being conducted in Indiana, under the direction of Dr. Harold E. Moore, of Indiana University. The aim of the study is to bring together the best current practices in pupil transportation, and to evolve a plan for the improvement of the financing and administration of transportation in Indiana.

SCHOOL-BUILDING CONSTRUCTION

Dodge reports that in 37 states east of the Rocky Mountains, contracts were let during the month of October for 162 educational buildings, at a cost of $19,189,000.

According to Dodge, the total of contracts let in 37 states east of the Rocky Mountains during the first ten months of 1945 was $95,123,000.

SCHOOL-BOND SALES

During the month of November, 1945, school bonds were sold, in the amount of $2,976,360, and short-term paper, included refunding bonds, were sold to a total of $2,963,000. The average interest rate was 1.51 per cent.

FINANCE AND TAXATION

► Waterbury, Conn. The board of education has prepared a budget for 1945-46, calling for slightly in excess of $2,000,000, which is an increase over the 1945 estimate of $1,949,332.

► Madison, Wis. The board of education has approved its 1946 budget calling for a minimum of $1,732,359, which is an increase over the 1945 budget of $1,687,648.

► Joplin, Mo. A budget of $795,000 has been adopted for the operation of the schools in 1946, which includes an emergency reserve fund of $50,000.

► Sioux City, Iowa. The school board has made a payment of $35,000 on the bonded indebtedness of the school district, which has reduced the total debt to $573,000. This amount will be entirely liquidated in 1951.

► Fall River, Mass. The school board has approved a budget of $1,762,220 for the school year 1946. Of the total, $1,297,850 will be for the superintendent of schools department, and $464,730 for the building department.

► New Bedford, Mass. The school board has approved a budget of $1,728,572 for the school year 1946, which is an increase of $232,238 over the year 1945. Salaries and wages, the largest single item, calls for $1,558,974.

► Leominster, Mass. The school board has adopted a budget of $436,694 for the year 1946. Of the total, $388,474 is set aside for teachers' salaries.

NEBRASKA CITY REDUCES SCHOOL DEBT

The board of education of Nebraska City, Neb., has voted to pay another $10,000 on the school debt, which reduces the district's indebtedness to $145,000 and raises to $30,000 the amount of the debt paid in 1945. The board's action will save the school district $600 a year in interest. In the past three years the district paid off $50,000 in bonds and $18,622 in registered warrants.

Washington News

INTERNATIONAL EDUCATION

At the final session of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), held in London, November 16, 1945, a constitution was adopted for submission to the 42 nations represented by delegates and advisers.

It is expected that this constitution will go into effect shortly and that the seat of the organization will be established in Paris during 1946.

The purpose of the organization will be the promotion of science, culture, and education as the basis for international peace. Each nation is to be represented by a national commission, made up of outstanding educators and scientists. An immediate purpose will be the rehabilitation of the educational systems of the afflicted liberated countries for the better promotion of democratic political action and international peace.

The American delegation was headed by Mr. Archibald MacLeish, former assistant secretary of state, and included as an adviser, Commissioner John W. Studebaker.

College and university enrollments increased in September, 1945, with an upward swing of over 200,000, or an estimated increase of 25 per cent, according to Dr. John W. Studebaker, Commissioner of Education.

Commenting on the situation, Commissioner Studebaker said that higher education, in the first few months after V-J day, gained back almost one third of the number of student enrollments lost during the war period.

The fall enrollments of 1939-40 hit a prewar peak of 1,400,000, but in the autumn of 1943-44, registrations dropped sharply, going to a low of 750,000. The 950,000 enrollment figure last fall represented an increase of collegiate activity to a point close to one third of the way from the wartime low to the wartime high. Reports have indicated that the increased college enrollments are part of the V-J transition, which involves the return to school of war veterans and college youths whose education was interrupted by military service or employment in civilian wartime occupations.

SURPLUS PROPERTY

The U. S. Office of Education has requested the several state departments of education to establish agencies for handling surplus war property to be sold to local school authorities.

The recommendation which has the support of Robert C. Ayres, of the Office of War Property Distribution, and of W. S. Symington, Surplus Property Administrator, is intended to implement the orderly observance of SPA Regulation 14, under which school authorities may purchase property which is available at a total price of 40 per cent of fair value of all articles offered.

The Office of Education compiled and distributed lists of available types of materials and of educational claimants under the terms of the Surplus Property Act.

The state educational agencies for surplus property will be expected to give clearance to requests made by local school authorities, to advise and consult with the representatives of the U. S. Office, and in other ways to coordinate the acquisition of surplus property by the schools.

One of the first steps to be undertaken will be the preparation of lists of needs and to assist the local authorities in discovering articles which are available. The state agencies will also be expected to help small schools to co-operate with others in obtaining materials which will be sold only in large quantity by the federal agencies.

THE H.R. 4499 BILL IN CONGRESS

Introduced in Congress by Congressman Matthew M. Neely, Bill H.R. 4499 seeks to provide, through aid to the states for surveys of the need for public educational plant facilities, for the preparation of drawings and specifications for such facilities, and for their construction or acquisition.

The bill is based on the principle that since the provision of adequate plant facilities cannot well be divorced from considerations of curriculum, of school organization, and educational policy, and since education is a state function, federal participation in the planning and construction of buildings must take the form of grants-in-aid to the states with full responsibility resting on the states, with minimum federal safeguards.

In order for all states and localities to receive equitable treatment, the bill provides that federal funds for educational plant facilities be apportioned to states according to an objective formula which recognizes the abilities of the states to finance construction to house their educational services.

Section 2 provides $5,000,000 for a three-year survey of plant needs. Section 3 provides $40,000,000 for a five-year program of preparing drawings and specifications, 99 per cent of which is to be apportioned to states according to school population. Section 4 provides $1,500,000 for a seven-year program of plant acquisition, construction, and improvement of educational plant facilities.

ARRANGEMENTS COMPLETED

Mr. S. D. Shankland, secretary of the American Association of School Administrators, has announced definitely the completion of arrangements for the four regional conferences of the American Association.

Kansas City, February 20-22, will hold its meetings in the Kansas City auditorium. No hotel headquarters has been chosen.

Atlanta, Ga. February 25-27, will hold its meetings at the Municipal Auditorium. No headquarters has been announced.

New York, March 4-7, will center the meetings

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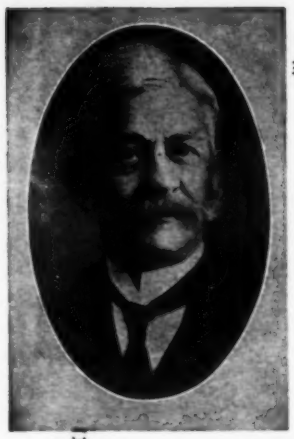

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have cooperated in an almost unbelievable way. Irritating delays, shortage and confusion have been met with a spirit of friendliness, good temper and understanding.

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and exhibit in the Pennsylvania Hotel.

Chicago, March 12-14, will center the meetings and exhibit in the Stevens Hotel.

The invitations to the convention will be limited to members who hold 1946 membership cards in the Association.

SUMMER CAMPS

Summer camps as a substitute for military training is proposed by a group of educators and camping enthusiasts who feel that camping experience of four months will do all that a year's service under army or navy auspices will do. The proponents who are pointing to a bill introduced in New York State, feel that such a program controlled by state and local school authorities and financed by a federal subsidy will be ample for any needed preparedness.

REVISED STANDARDS FOR FINE AND WRAPPER PAPERS

The National Bureau of Standards has proposed new simplified standards for all fine and wrapping papers, based on the principles of the report of the committee on simplification, of the National Paper Trade Association.

The committee has recommended that the weight of all fine and wrapping papers be computed on the basis of 1000 sheets of 1000 square inches, and that it provide a series of standard weight numbers for fine and wrapping papers. Methods of calculating the weight in pounds per 1000 sheets of fine and wrapping paper are also given.

► The Selective Service System, on November 29, recommended to local draft boards that they defer registrants who are studying or teaching physical sciences or engineering as part of a plan to increase the nation's scientific knowledge.

► The U. S. Office of Education has announced a new publication entitled, "Statistics of Public School Libraries, 1941-42," which contains comprehensive statistics of public elementary and secondary school libraries. The study of 54 pages, includes six graphs and 35 statistical tables, and sells at 15 cents.

MAKING AMERICA CONSCIOUS OF THE UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANIZATION

Beginning in December the Educational Policy Commission of the National Education Association and the American Association of School Administrators opened a series of meetings across the whole country to acquaint both professional and lay people interested in education with the ideas and ideals of the United Nations Educational, Scientific and Cultural Organization.

The schedule of cities picked for conferences includes Detroit, Evanston, Illinois, Los Angeles, Minneapolis, Nashville, Philadelphia, and Seattle. It has been announced that by the end of January possibly half a dozen more centers will be picked so that the entire nation will be "carpeted" with a pattern of discussions to give a background of UNESCO.

In the words of the announcement of the Evanston meeting under the joint auspices of Northwestern University and the Policy Commission, the meetings will present "proposals for the promotion of peace, better understanding and co-operation among the peoples of the world through the interchange and development of educational, scientific and cultural ideas and ideals."

Using the Evanston conference on December 19 as something of a pattern for the whole movement, the significant steps to be taken to implement the ideals of UNESCO are first, to have people attending such meetings as consultants communicate with their organizations and institutions to promote congressional support for the adoption of the UNESCO charter when the matter comes before Congress. In addition, it was the expressed hope that by wide dissemination of information on the projected organization, education would find greater acceptance and support. Observers found a third need, which is possibly most difficult of all problems confronting UNESCO. That is how to implement its ideas and ideals with American schools and colleges through actively molding curriculums with an international bias.

SEPARATE SCHOOLS FOR WAR VETERANS

Boards of education in New York State have found it desirable to have separate schools for war veterans since these veterans are older than pupils attending vocational high schools. Vocational schools for veterans are now in operation in New York City, Elmira, and Troy.

In Elmira, the board has established a special school, with 50 veterans enrolled. All courses are 1000 hours in length, except the combined aircraft and engine-mechanics course, which is 1920 hours.

In New York City, two schools are operated.

In Troy, a school is conducted. Courses are conducted for 48 weeks, and each week consists of five days of six hours each.

One hundred veterans are now enrolled at the State Agricultural and Technical Institutes at Alfred, Canton, and Morrisville. A number of two-year technical courses are offered, providing ideal vocational opportunities for veterans with terminal training below the college level.

TEACHERS AND ADMINISTRATION

► Lincoln, Neb. The board of education has returned to the prewar age limit of 68 as the compulsory retirement age for the school employees, with the idea of lowering it to 65 in the next few years. It was found that many employees desired to retain their positions until they reach the age of 68.

► Waltham, Mass. The school board has set up new standards for teachers to be employed in the schools.

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And they'll become fact — as soon as we finish licking our problem of delayed action.

Shipping delays! Shortages of men and materials! These are some of the things that have kept us from completing our program on time.

But we haven't changed our plans!

We will still be able to make an announcement that will spell *news* — great news for every one of our distributors, and for everyone purchasing scissors and shears. And we still intend to back our dealers with advertising — as soon as that news breaks.

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Personal News

► Supt. L. B. Piercy, of Eddyville, Ky., has been elected president of the Western Kentucky Agriculture Teachers' Association.

► Supt. Charles I. Henry, of Mayfield, Ky., has resigned on account of ill-health.

► R. G. Bennett, of Manton, Mich., has accepted the superintendency at Charlevoix.

► Major W. E. Lawson has returned to his former position of superintendent of schools at Cynthiana, Ky. Major Lawson has been on leave of absence since August, 1941.

► Lyman B. Owen has been elected superintendent of schools at Haverhill, Mass.

► Supt. Joseph C. Wagner, of Hartford City, Ind., has announced his resignation, effective January 1.

► Joseph C. Wagner, of Hartford City, Ind., has accepted the superintendency at Crawfordsville.

► Lt. Col. Edward T. Whiting, former superintendent of schools at Gordon, Neb., has been awarded the Bronze Star for gallantry in action in France.

► Supt. Clyde Parker, of Moline, Ill., has been elected secretary of the Illinois City Superintendents' Association.

► Dr. Terence C. Donahue has been elected assistant superintendent of schools at Springfield, Mass.

► Supt. Arthur Dondineau, of Detroit, Mich., was the guest of the evening at a reception tendered him by the Detroit Parent-Teacher Association on November 5, when a crowd of 2500 school employees gathered to greet him. Presentation of "The Golden Horse Shoe," an original radio play based on the life of Arthur Dondineau, was given at the Art Institute, with the aid of students from the various high schools. Superintendent Dondineau climaxed the evening by cutting a birthday cake.

► Marquis E. Shattuck has been elected assistant superintendent of schools at Detroit, Mich. He was formerly divisional director of language education.

► Mr. Lawrence Harper has succeeded Mr. Roy E. Simpson as superintendent of schools at South Pasadena, Calif.

► Col. Francis T. Spaulding has been appointed State Commissioner of Education of New York State, to succeed Dr. George D. Stoddard. Col. Spaulding will take over his new duties on July 1, 1946. He is now on leave of absence, serving as chief of the army education branch of the War Department.

► Maurice G. Postley, superintendent of school supplies of the New York City board of education since 1943, is leaving the school system to enter private business. The resignation becomes effective January 8, when he will become associated with his brother in the Bailey-Postley Sales Company. Both Superintendent John E. Wade and President Mary E. Dillon of the board have commended Mr. Postley for his long and faithful service to the schools.

MR. BAKER TO RETIRE

Mr. B. B. Baker, superintendent of schools at Fairfield, Ala., will retire in June, 1946, after 50 years of public school work, of which 41 years were spent in Alabama. Mr. Baker is retiring for the reason that he has reached the age of 70 when retirement is compulsory. He was given a surprise birthday party by the faculty and pupils of the Fairfield schools.

Mr. Baker came to the Fairfield schools in 1923, after an extensive background of public education. He obtained his first teaching certificate at 17 years of age, and recalls his first salary of $25 a month, which was considered fairly good in those days. He taught school in the one-room rural schools, then went to Mobile for five years, and for seven years headed the normal school at Daphne, Ala. Later he was superintendent of schools at Roanoke and Dothan, Ala.

COMING CONVENTIONS

January 9–11. Association of American Colleges at Cleveland, Ohio. Guy E. Snavely, secretary, 744 Jackson Place, Washington 6, D. C.

January 17–19. American Association of Junior Colleges at Chicago, Illinois. Winnifred L. Long, acting executive secretary, 1201 — 19th St., N.W., Washington 6, D. C. Headquarters, Edgewater Beach Hotel.

January 28–February 1. National Recreation Association at Atlantic City, N. J. Thomas E. Rivers, secretary, 315 Fourth Ave., New York 10, N. Y. Headquarters, Claridge Hotel.

January 30–February 2. Iowa State Education Association at Des Moines, Iowa. Harry G. Barnes, secretary, 415 Shops Bldg., Des Moines, Iowa.

February (no definite date). Indiana Town and City Superintendent's Association at Indianapolis, Ind. H. H. Mourer, Bedford, Ind. Headquarters, Lincoln Hotel.

February 6–7. Pennsylvania Association of School Board Secretaries at Harrisburg, Pa. R. E. Boswell, secretary, 121 Chestnut Street, Harrisburg, Pa. Headquarters, Penn-Harris Hotel.

February 6–7. Pennsylvania State School Directors Assoc. at Harrisburg, Pa. P. O. Van Ness, secretary, 222 Locust St., Harrisburg, Pa. Headquarters, Penn-Harris Hotel.

February 6–9. American Vocational Association at Buffalo, N. Y. L. H. Dennis, executive secretary, 1010 Vermont Ave., S.W., Washington, D. C. Headquarters, Statler Hotel.

February 13–15. Minnesota State School Board Association at Minneapolis, Minn. John E. Palmer, secretary, 613 Vernon, East Fergus Falls, Minn. Headquarters, Nicollet Hotel.

February 13–15. New Mexico Education Association at Sante Fe, N. M. R. J. Mullins, secretary, 114 E. Marcy St., Sante Fe, N. M.

February 19–21. American Educational Research Association at Kansas City, Mo. David Segel, secretary, U. S. Office of Education, Washington, D. C.

February 26–28. American Educational Research Association at Atlanta, Ga. Secretary same as above.

February 19–22. National School Service Institute at Chicago, Ill. Frank Bruce, secretary, 540 North Milwaukee Street, Milwaukee 1, Wis. Headquarters, Palmer House.

February 21–24. Music Teachers National Association at Detroit, Mich. Dr. Wilton C. Bain, No. Texas Tchrs. College, Denton, Tex., secretary. Headquarters, Statler Hotel.

February 22–23. American Education Fellowship Regional Conference at Chicago, Ill. Lester Ball, Supt. Schl. Dist. 108, Highland Park, Ill., secretary. Headquarters, Sherman Hotel.

February 19–21. American Assoc. of School Administrators at Kansas City, Mo., S. D. Shankland, secretary, 1201 — 16th St., N.W., Washington 6, D. C. (Regional Meeting)

February 26–28. American Assoc. of School Administrators at Atlanta, Ga. Secretary same as above. (Regional Meeting)

March 21–23. Department of Supervision and Curriculum Development of the N.E.A., at St. Louis, Mo. Gertrude Hankamp, secretary.

Synchronize School TIME and SIGNALS *with*

NATIONAL

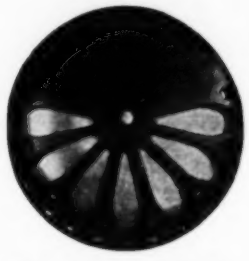
Automatic Program Clocks and Equipment

THEY'RE ON TIME ALL THE TIME!

Electric **Room Clocks National** Type 010 **4 Standard Dial Sizes** 10"—12"—15" **and 18". Surface** Mounting — **Finished in Olive** Green Wrinkle—**Complete with** Sway-proof **hangerplate. Plugs** into your **110 Volt light Circuit**— Synchronizes **itself.**

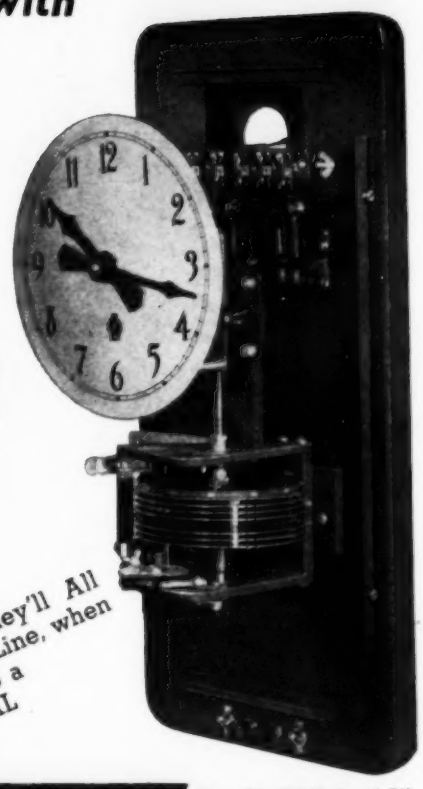
The NATIONAL Program Clock and all auxiliary clocks—and all bells on the system—register Arlington accurate time and signals, in precise co-ordination with class dismissals!

No. 704 A. C. No-contact 4" vibrating bell for shops and gymnasium.



8" or 10" Loud ringing, fully guarded Yard Gong for Outdoors.

6" or 8" No-contact A. C. clear-toned bell for corridors.



"10:17½ BELL TIME" — They'll All Ring Right down the Line, when hooked up to a NATIONAL

No. 112 A. C. Surface mounting **No-contact buzzer for class** rooms. **Adjustable** tone.

NATIONAL TIME & SIGNAL CORPORATION

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Type 52-12M National All-Electric 3 Minute Interval Program Clock. Direct-driven Program discs—Rings 2 different Schedules — Automatic week-end silencing.

Four **complete books in** one . .. **laboratory equipment for junior and senior** high **schools and junior colleges.**

THIS NEW BOOK WILL HELP YOU PLAN...

- If you're planning new laboratories or rearranging present rooms, you need our new Laboratory Equipment Catalog. Section 209-A shows photographs of actual *Hamilton* installations and contains many suggestions for general science laboratories, showing how *standard* equipment can be arranged to meet your layout problems.
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☐ INSTRUCTORS' ☐ PLANNING ☐ STUDENT TABLE ☐ STORAGE CASE ☐ ENTIRE CATALOG

HAMILTON MANUFACTURING COMPANY
TWO RIVERS, WISCONSIN
Please send the section I have checked.

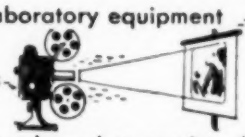
SBJ 1-46

Name .....
School .....
Address .....
City ..... Zone .... State .....

Why You will Want Mosinee Towels In Your School Washrooms

There are several reasons why you should use Mosinee Towels in your school washrooms as soon as they are again available in greater quantities. In this and coming advertisements we'd like to point out some of the reasons why—

The product of any educational system is the pupil.

Good teachers equipped with better teaching aids and improved laboratory equipment plus the use of high quality supplies  to make schools safer and more sanitary are bound to produce better educated pupils equipped to make finer citizens.

Mosinee Towels have the "dryability" which enables them to provide the highest quality towel service. They are made by a mill which has been a member of the National School Service Institute for many years. They are distributed by school supply distributors who are set up to give the individual school excellent service in the most economical way.

BAY WEST PAPER CO.
Green Bay, Wisconsin
A Division of Mosinee Paper Mills Co.

Mosinee SULPHATE TOWELS
PREP-TOWLS • ZIP-TOWLS • TURN-TOWLS • ROLTOWLS

SCHOOL FLOORS IN WINTERTIME

(Concluded from page 46)

time and toil, but we who live in a land of changing seasons usually find it easy to adapt ourselves to those changes. And after all the capacity for adaption is an essential for success in any line of endeavor.

PLACER UNION HIGH SCHOOL PLANS SWIMMING POOL

(Concluded from page 50)

gave access from any direction to the boys' and girls' dressing rooms on the basement floor without mixing bathers' traffic and clothed traffic. The clothed traffic entered one set of doors to the dressing rooms and emerged in bathing suits from another set of doors. Going to the pool a bather passed the central control, through the showers and foot bath and then to the pool. Returning, the same course was followed in reverse order.

It was necessary to modify the existing boys' locker and shower rooms to accommodate men and boys (public) in separate rooms. The existing girls' locker rooms already provided dressing rooms and showers suitable for the mixed usage of women and girls. The existing heating plant was adequate to maintain the pool water at a temperature of 78 degrees or greater if desired. A circulating filtration and chlorination plant was planned, housed underground at the deep end of the pool.

The pool and bleacher area was lighted by flood lights mounted on steel poles. Underwater lighting was provided in the pool, the fixtures accessible without emptying the pool, by means of a pipe tunnel entirely surrounding the pool and connecting with the filter room at the deep end of the pool.

Standard pool equipment was furnished, high and low diving boards, lookout's elevated chair, ladders, etc. The swimming lanes were marked on the bottom of the pool in black lines. A plug-in arrangement for "walkie-talkie" address system was provided for use of instructors and announcers.

In the future, if joint lounging or sunning areas for bathers and clothed public are developed outside the pool area, it will still be possible to maintain the separation of bathers and clothed public within the pool walls. Bathers going to lounging area would exit from the pool enclosure through a gate at the shallow end of the pool but could not re-enter through the same gate. It would be necessary to re-enter at the point of central control and pass through the showers and foot bath in the usual sequence.

It is believed that the flexibility necessary to the problem has been achieved by the plan arrangement.

CLEVELAND PLANS ELEMENTARY SCHOOLS

(Concluded from page 55)

When daylight is included, the actual intensity of lighting on the inner desks farthest from the windows, is 20 foot-candles or more, depending upon the brightness of the day. Yet the total wattage required is only 600 watts per classroom.

In the gymnasiums, incandescent lighting will be used, with flush ceiling fixtures, and with louvers underneath to provide protection.

Costs

The costs of the buildings described are about 30 per cent higher than those encountered by the Cleveland board of education in its building program in 1940, and even as late as 1944. This is believed to be attributable to (*a*) the smallness of these units; (*b*) inclusion of boiler room, offices, and other service rooms, needed for larger buildings, in these first units which are planned for additions; (*c*) heavier construction needed to allow for future second stories; (*d*) labor shortages and premium pay necessary to secure qualified workmen; and (*e*) higher costs of some materials.

Because of the impelling need, the board decided that it could not gamble on the possibility of reduced prices at some future time, but must proceed to house the children

► Dr. Allen R. Congdon, national treasurer of Phi Delta Kappa, died at Lincoln, Neb., on November 11. Dr. Congdon, a graduate of the University of Nebraska, held the Ph.D. degree from Teachers College, Columbia, and had served as principal and superintendent of schools at Lincoln, Omaha, Fremont, and Wahoo, Neb. He had been on the faculty of the State University since 1919, as professor of education and director of education

● "A cheerful atmosphere . . . an attractive library . . . informal in character and practicable."

Miss Sophie A. Udin, Director and Librarian

ZIONIST ARCHIVES AND LIBRARY

chose **GAYLORD BROS.** *Furniture and Equipment*

Librarian's Desk — workroom in rear.

Reading Room — general information desk in center.

● "This," says Miss Udin, "is a special library—where students, research workers, authors, newspapermen, radio script writers, etc., come to get information on Zionism, Palestine, and the Middle East and post-war problems."

It is housed—for the convenience of these professional seekers after information—on the twenty-first floor of an office building at 41 East 42nd St., New York City. Its windows look far across Manhattan to the Palisades. It is a library with two kinds of vision. There's the vision of its founders, who sought to make information readily available on Zionism. And there's the vision which dictated its convenient location, it's disarming air of casualness—and the pleasant pastime of thinking long thoughts—of digesting opinions—while gazing in revery from its lofty windows.

Its pink-beige walls, beige linoleum with russet brown borders, venetian blinds that match the walls, with tapes that match the floor border—these are a perfect background for the informality and inviting comfort of **GAYLORD BROS.** furniture and equipment. It is a library for the use of impatient men, with deadlines to meet. **GAYLORD** equipment gets the information quickly—**GAYLORD** furniture makes it a pleasant place to do research.

Gaylord Bros. INC. SYRACUSE, N. Y. STOCKTON, CALIF.

Originators and Builders of Better Library Furniture and Supplies

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STEEL FOLDING CHAIRS *AGAIN* in Production

backed by the same **10-YEAR GUARANTEE** given since 1925

Is your order in?

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CLARIN MFG. CO.

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There are more *Clarin* Steel Folding Chairs in Institutional Service than any other make

Oh! What a Difference

between ordinary projection and the brilliant, surpassing motion picture projection afforded by Holmes Sound-on-Film machines.

See, hear and compare

the Holmes Projector and draw your own conclusions. Remember, the Holmes is the only 16 mm. projector with large 10-tooth sprockets, making threading and operation easier.

Holmes

PROJECTOR COMPANY

Manufacturers of 16mm and 35mm Sound-on-Film Projectors of over 25 years to Dealers and Users

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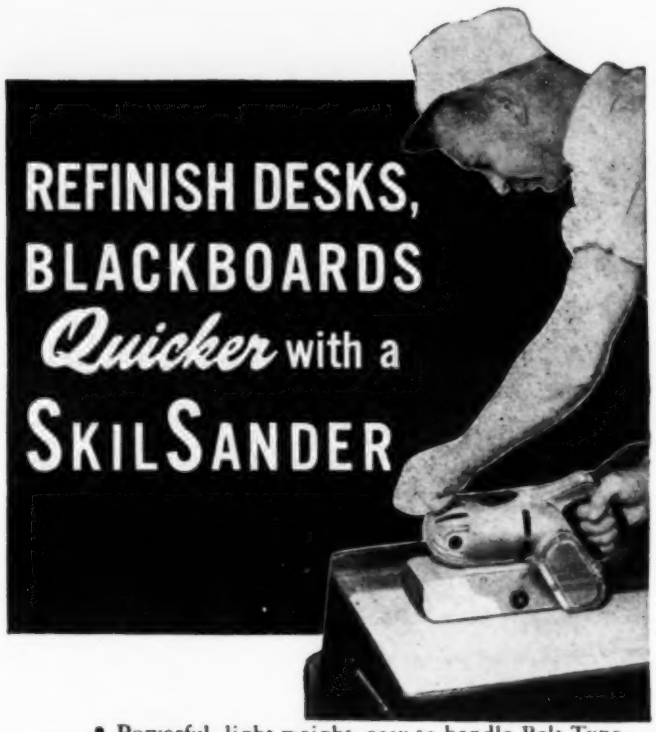

• Powerful, light weight, easy-to-handle Belt Type SKILSANDERS quickly restore a new finish to *all* woodwork and blackboards. Operate from any light socket. *Perfect for manual training shop use.* Part of a complete line of Portable Electric SKILTOOLS. Ask your distributor for a demonstration!

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5033-43 Elston Ave., Chicago 30, Ill.

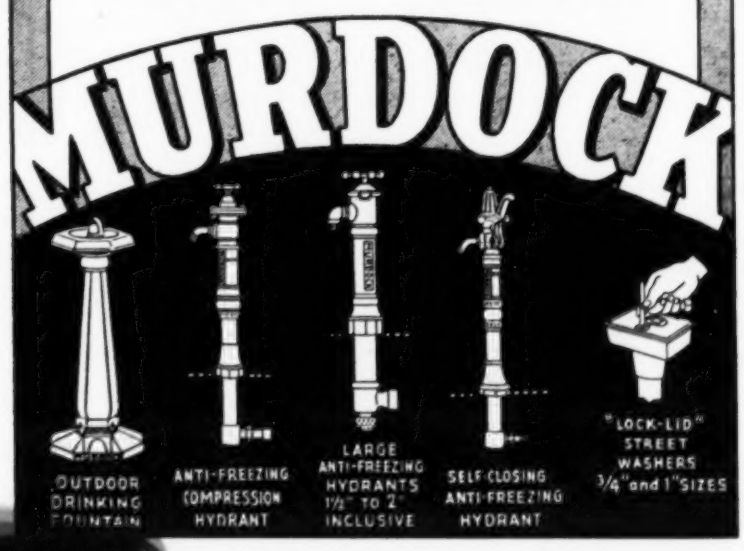
Factory Branches in All Principal Cities

When You See The Blue Prints

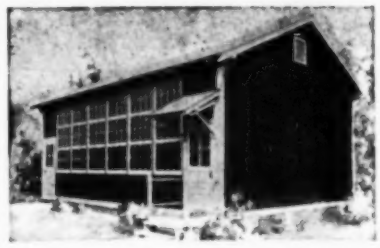
When you look over architects' renderings of proposed Playgrounds, Recreation Centers, Stadii, etc., SEE if adequate provisions have been made for Outdoor Drinking Fountains.

America is blessed with good water. Make it freely available to our youth.

The Murdock Mfg. & Supply Co.,
426 Plum St., Cincinnati 2, Ohio


MURDOCK
OUTDOOR DRINKING FOUNTAIN
ANTI-FREEZING COMPRESSION HYDRANT
LARGE ANTI-FREEZING HYDRANTS 1½" TO 2" INCLUSIVE
SELF CLOSING ANTI-FREEZING HYDRANT
"LOCK-LID" STREET WASHERS 3/4" and 1" SIZES

NOW YOU CAN



Relieve that Crowded Condition with a Minter Portable School

Minter schools have for many years been the logical solution to the problem of combining speed, service and saving in the erection of a school. They are definitely permanent structures but offer the distinct advantage of permitting speedy dismanteling and re-erection at another location with a loss of material so low as to be relatively insignificant.

MINTER HOMES CORP. Huntington 13, W. Va.
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McFadden Corporation, Lansing, Mich.

ECLIPSE PUPILS' DESKS

61 Desks No. 3
16 Backs No. 3
12 Desks No. 4
21 Backs No. 4
40 Desks No. 5
20 Backs No. 5

Desks at $2.00 each; Backs at $1.00 each. Write to Boone Public Schools, c/o Supt. A. B. Grimes, Boone, Iowa.

Dudley Locks Banish Locker Room Troubles

Dependable Dudley locks resist picking and forcing . . . and a master chart, furnished with each installation, consecutively lists lock numbers and combinations.

The famous Dudley Rotodial (RD2) will again be available in stainless steel. The Rotopoint (RP5) is now made in a steel cased, self-locking model.

See your Dudley representative for details on the complete line which includes built-in types with the master-keyed feature.

RD2

DUDLEY LOCK CORPORATION

Dept. 112 570 W. MONROE ST. CHICAGO 6, ILL.

POSTWAR SCHOOL-BUILDING PROGRAMS AND PLANNING

(Concluded from page 21)

the senior high school buildings, $850 for both the first and third groups; the least differential, in the same building category, is found in group four—$200.

As stated, the writer does not have the temerity (and the detailed facts) to interpret the data of this table, but a "free lance" as well as others could go "a jousting" among these figures, and have plenty of opportunity for real adventure in the land of imagination and interpretation—and he will probably break his literary lance on the windmill of objections, from the spectators. An extended paper could be written on this phase of the subject alone: but we shall skip it and leave the subject, even if it is left dangling just now.

In closing, we may say that this article is in the nature of an introduction to the original study and deals more with the over-all picture and financial data. It will be followed by an analysis of a large number of facts and details as presented in the reports as well as a study of trends in the school-building construction field and some equipment data.

BUILDING FACILITIES FOR AUDIO-VISUAL EDUCATION

(Concluded from page 26)

For opaque projection materials—drawer or file space.

For storage of projectors and repair equipment—space measuring 10 by 3 by 3 ft.

If the school program calls for equipping all rooms for audio-visual work, each room should be provided with sufficient storage space; however, if the school program is based on the use of a central projection room, a storage and repair room of about 22 by 14 by 12 ft., adjoining the projection room, should be adequate.

Some authorities believe that in the future the schools will use the rear projection method in their classroom audio-visual work, thereby eliminating to a large extent the problems of darkening and ventilating. However, most currently available machines of the rear-projection type produce a rather small picture, and the machines are too heavy to be moved readily from room to room.

In the future schools must provide rooms in which students may use films and other audio-visual aids as a part of their study program, just as they now use the library.

DESIGNING AND CREATING TOMORROW'S SCHOOLS

(Concluded from page 28)

students into the community for study and exchange of ideas. Thus the community educational center could provide a Youth Hostel for travelers and could make available to these travelers all the educational opportunities of the local community. The community center could maintain bicycles, trailers, and bus equipment and provide personnel and funds for transporting students into other areas for study as group or as individual units. Wealthy communities might also own and operate a camp or farm in the country to provide these experiences for its students, and suburban or rural communities might own a club or city office to make vocational contacts for student work experience in the city and to conduct them through cultural centers there. In addition the community might set up educational travel scholarships for longer trips and for those who could not afford to go unaided. The swarm of young people who descend every spring upon the nation's Capital is evidence that parents appreciate this need of broader horizons, but the Capital is not the only place rich in educational lore. A three-month travel period should be part of every young person's educational equipment, and he might be given a certain amount of public community work during his entire school career to defray the cost of the tour that the community would provide for him.

Out of the chemical laboratories, the soil, the engineering tables, the designers' boards, and the thoughtful meeting of the minds of the educators, community leaders, and architects, and the individual toil of every citizen, should come tomorrow's schools. They will be buildings, equipment, and experiences woven together to equip all the members of the community with the moral, mental, and physical tools for better living in the real world around them.

PYRA-SEAL IS BACK!

The Same Pre-War Floor Seal to Give Post-War Floor Protection

IMMEDIATE DELIVERY NOW!

Yes—we can make deliveries now. Pyra-Seal is in production, in generous quantities too.

It will be the same pre-war product, the same pre-war formula that American school-keepers have relied on to lighten floor maintenance labor and to justify their pride in bright sealed polished wood floors.

During the war the Government commandeered ingredients essential to the manufacture of PYRA-SEAL. We would not substitute inferior "ersatz." So we withdrew PYRA-SEAL from the market. Now these vital ingredients are again obtainable...and PYRA-SEAL IS BACK.

Approved and Recommended by Maple Flooring Manufacturers Assn. National Oak Flooring Manufacturers Assn. Leading Architects.

VESTAL INC.
ST. LOUIS NEW YORK

New Supplies and Equipment

Production, Service, and Sales News for School Buyers

PORTABLE VACUUM CLEANERS

Ten types of portable Exidust vacuum cleaners are illustrated in a new bulletin of the Allen Billmyre Company, with dimensions, capacity, and performance for all models and sizes. The bulletin makes clear the advantages of Exidust vacuum cleaners for cleaning floors, walls, machine parts, pipe and other structures.

Allen Billmyre Company, 431 *Fayette Avenue, Mamaronec, N. Y.*

For brief reference use ASBJ—101.

MARKING SCHOOL EQUIPMENT

Floquil Products Inc., has called attention to the flexibility of Floquil Fountain Markers for labeling and otherwise "marking" school equipment, particularly, athletic equipment and other articles loaned to students. The Floquil transparent colors are permanent and will not wash off, even from aquatic equipment. Similar permanence is gained on wood, leather, metal, and plastic articles.

Floquil Products, Inc., 1933 *Broadway, New York* 23, *N. Y.*

For brief reference use ASBJ—102.

FOAMGLAS INSULATION OF TANKS

Foamglas, a cellular inorganic material, not subject to the deterioration affecting organic substances used for insulation, has been made available in block form for heat and cold control of tanks, towers, ducats, and breeching.

A complete catalog describing the material and giving directions for application under a wide variety of situations has been made available by the manufacturers. Complete directions are given for finish, covering, and painting.

Foamglas has successfully withstood a 24-hour exposure of 1200°F. without evidence of combustion or loss of weight, and has been approved by Underwriters' Laboratories, Inc. Other tests have shown complete resistance to water. The material is rigid and will support loads of 5000 pounds per sq. ft. when protected from point loading.

Pittsburgh Corning Corporation, 632 *Duquesne Way, Pittsburgh* 22, *Pa.*

For brief reference use ASBJ—103.

CELEBRATE SILVER ANNIVERSARY

The Elkay Manufacturing Company of Cicero, Ill., have just celebrated their twenty-fifth year of successful manufacturing activity in the making of high-grade butler's pantry sinks, lavatories, and galvanized steel scullery sinks.

Mr. Louis Katz, one of the founders of the firm, was a pioneer in the design of special kitchen and pantry sinks for schools, hospitals, laboratories, and institutions where unusual conditions of service have to be met, and where optimum conditions of sanitation have to be maintained with a minimum of cleaning and other care.

The Elkay products now include lavatories of monel metal, special kitchen sinks, drinking fountains, laboratory sinks, and a variety of special products in which good appearance and sanitary maintenance are paramount. A silver Jubilee souvenir booklet not only gives tribute to the men who make Elkay equipment, but illustrates the use of various specialties under typical working conditions.

Elkay Manufacturing Company, 1874 *South 54th Avenue, Chicago* 50, *Cicero, Ill.*

For brief reference use ASBJ—104.

SIXTEEN MILLIMETER MOTION PICTURE FILMS

The new, 13th Edition of "16mm. Motion Pictures" for school and institutional instructional and entertainment purposes, has just been released by International Theatrical and Television Corp. The book which includes not only feature films but also documentary and instructional subjects, provides data on the content and instructional utility, cost, rental conditions, etc.

International Theatrical and Television Corp., 25 West 45th Street, New York 19, *N. Y.*

For brief reference use ASBJ—105.

VICTOR MOVES OFFICES

To increase production in accordance with the stepped-up demand for its sound motion picture projectors and allied equipment, the Victor Animatograph Corporation of Davenport, Iowa, has moved its general offices to the Kahl Building in the city's business district, it is announced by S. G. Rose, executive vice-president of the company.

The move enables the company to expand production space, install more machinery and increase personnel. Production is now at the highest peak in the company's history due to the demand from schools, churches, homes, and other sources.

Victor Animatograph Corporation, Kahl Building, Davenport, Iowa.

For brief reference use ASBJ—106.

OFFER NEW 16MM. SOUND PROJECTOR

An improved 16mm. sound film projector, incorporating war discovered technical advances, has been announced by the RCA Victor Division of the Radio Corporation of America. The new projector RCA Model 201, is designed primarily for schools and colleges where the highest quality of projection and sound are demanded with a minimum of difficulty in operation. Special features of Model 201 are war developed and battle tested. The machine has a 20-watt audio amplifier, removable film gate, silent belt drives, automatic film tension, etc. Complete catalogs are available.

RCA Victor Division, Radio Corporation of America, Camden, N. J.

For brief reference use ASBJ—107.

BRITANNICA FILMS

A total of more than 2800 Britannica classroom instructional films have been purchased by the state of Virginia for distribution among the public schools. The films are to be supplements to the textbooks, lectures, and other teaching methods used in city and rural schools, especially in such fields as economics, social sciences, science, home economics, industrial arts, etc.

For the use of public schools generally, Encyclopaedia Britannica Films have recently made available a reference booklet "chart" outlining the utilization scope of all Britannica classroom films. Teachers can exactly determine the character and value of any available film by referring to this type chart.

The Encyclopaedia Britannica, 20 North Wacker Drive, Chicago 6, Ill.

For brief reference use ASBJ—108.

ESTABLISH AIR-AGE EDUCATION CENTER

An Air-Age Education Service Center planned to offer immediate help in the development of aeronautical courses and individual instruction units at the elementary school level, has been put into operation by the Transcontinental & Western Air, Inc. Dr. J. H. Furbay, until recently a member of the staff of the United States Office of Education, has been appointed to head the Service Center. Photographs, charts, maps, and instructional outlines will be available shortly for use in high schools and colleges in addition to elementary school curricular materials.

Transcontinental & Western Air, Inc., Kansas City, Mo.

For brief reference use ASBJ—109.

SHORTHAND SLIDE FILM

The Gregg Publishing Company has recently completed a 35mm. sound slide film entitled "Taking Dictation and Transcribing." The film is the first of a series of audio-visual aids to be produced and distributed for secondary school use. The film is available both in silent and sound types, and may be purchased or rented.

The Gregg Publishing Company, 270 *Madison Avenue, New York* 16, *N. Y.*

For brief reference use ASBJ—110.

VISUAL AIDS CLINICS

The visual-aids instruction experts of the DeVry Corporation have been in demand by educational groups throughout the country. During October, November, and December, Dr. Charles R. Crakes, educational consultant, and Miss Norma Barts, visual demonstrator, have delivered lectures and given classroom teaching demonstrations in the middle West, and as far south as Oklahoma, and as far east as Pennsylvania. In Oklahoma, meetings were held in six cities under the auspices of the Extension Division of the University of Oklahoma.

The DeVry Corporation, 1111 *Armitage Avenue, Chicago* 14, *Ill.*

For quick reference, use ASBJ—111.

NEW MOTION PICTURES

Bell & Howell Company have announced the marketing of a new 0.5 inch F2.8 lens for use on 8mm. motion picture cameras. The lens ring is calibrated for "winter" and "summer" use under "bright," "hazy," and "dull" weather conditions. The new lens replaces a standard F3.5 lens and fits well the needs of schools that need high grade, moderate cost equipment.

The B & H Filmosound Library has been recently enriched by a color-sound 16mm. Kodachrome film, depicting the Monument Valley area in Arizona. The title is "Navajo Sand Painting." A silent film, entitled "American Antiquities," and depicting the Mesa Verde and Monument Valley country, is also available in silent-color form. Prints are available for purchase or rental.

Bell and Howell Company, 7100 *McCormick Rd., Chicago* 45, *Ill.*

For quick reference, use ASBJ—112.

INDUSTRIAL PROCESS CONTROL

A new book entitled "The Principles of Industrial Process Control," written by Donald P. Eckman, engineer of Brown Instrument Company, and devoted to methods of automatic, mechanical, and electrical control of engineering and industrial processes for efficient and economical production techniques has just been announced. The book is published by John Wiley & Sons, New York, and is intended both for students of chemical, metallurgical, mechanical, and electrical engineering, and also for practical production engineers.

Brown Instrument Company, 2830 *Fourth Avenue, S., Minneapolis* 8, *Minn.*

For brief reference, use ASBJ—113.

U. S. OFFICE EDUCATION FILMS

Kodachrome slides, more than 1500 in number, showing life in Central and South American Republics, are now available on loan. Recent releases cover an interesting list of films treating almost every subject. The slides, in natural color, 2 by 2 inches in size, may be projected from a standard size slide projector.

Sets of slides for 35 different titles are now available for free loan on request. Each set will be accompanied by teachers' notes giving information relating to the subject shown on each slide. The loan period is three weeks.

The U. S. Office of Education, Washington 25, *D. C.*

For brief reference use ASBJ—114.

REJOIN HERMAN NELSON ORGANIZATION

The Herman Nelson Corporation has announced the return from the United States military service of Commander Woodworth N. Murray, manager of the Boston and New England Branch office; Major John A. Finnerty, manager of the New York City Branch Office; Lieutenant Commander William J. Killian, products application engineer of the Cincinnati branch.

The three men held the respective offices, which they have resumed, before the war, and served with distinction in special capacities in the navy and army.

After the Meeting

No Buildings

An English school inspector was asking a missionary in Africa about the hygienic conditions prevailing in the mission schools.

"Have you the required number of cubic feet of air per pupil?" the official asked.

"Certainly," answered the missionary without hesitation.

"Is there plenty of light?" the official asked next.

"The schools are flooded with light," said the missionary.

"That's strange," said the inspector, "I have been all around the district, but I didn't notice any school buildings. In what villages are they?"

"Oh," replied the missionary, "there are no buildings, sir."

School Progress

Once a professor friend of mine flatly opposed a certain faculty action. He thought that it was undemocratic and said so. A somewhat cynical friend of his later gave him this advice: "Don't oppose things directly. Use an oblique approach. The silken glove is better than the mailed fist. You ought to know by this time that smart people in churches, in politics, or on college faculties are not against a proposal, especially a forward-looking one. They are for the proposal, but there are 'good' reasons why it should not be put into effect *now*." — *Edgar Dale, Ohio State University.*

Too, too Late!

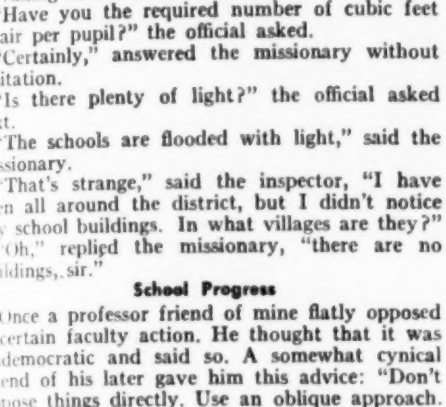
The famous educator was particularly obscure and dull that warm afternoon, and the long-suffering teachers in attendance at the convention were tired. When the speaker finally attempted to sum up the burden of his argument with the remark: "Well, to make a long story short . . . " a voice shouted, "Brother, it is too late for that."

Lost

At an educational conference a particularly dry speaker turned to a teacher at his right and said, "Do you follow me?"

"I have so far," answered the teacher, shifting wearily about on his chair, "but I'll say frankly that if I thought I could find my way back, I'd quit right here." — *N. E. A. Journal.*

The small son of a certain university professor, whose parents are deservedly popular for their tact and courteous speech, appeared at the home of a fellow professor and hesitatingly asked Mrs. X if he might look at the parlor rug. Permission was, of course, granted and Mrs. X felt some surprise to see the little fellow stoop over the rug and stare silently for some half minute. He straightened himself up and, meeting her wondering expression, said triumphantly: "It doesn't make me sick!"



Teacher was giving a general knowledge lesson. "Now, boys," he said, "would any of you like to ask me a question about animals or birds?"

A little boy stood up and said:

"Please, teacher, how do hens know the size of our egg cups?"

Guide to Products and Services

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THE AMERICAN SCHOOL BOARD JOURNAL
540 North Milwaukee St., Milwaukee 1, Wis.

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Practically indestructible — made of plastic impervious to acid in ink.

No parts to separate and become lost or broken — lid is hinged into body of inkwell.

No glass inset to break.

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Sengbusch Noiseless School Inkwells

eliminate breakage and replacement costs . . . .

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The guard holds the inkwell firmly in place and prevents it from being pushed out of the desk by books.

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Two popular styles made for your present desks...

The experience of hundreds of Sengbusch-equipped schools shows that Sengbusch Noiseless School Inkwells help solve your inkwell problems these three ways:

1. They resist all destruction common with many other school inkwells, thus eliminating replacement expense.
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Sengbusch Noiseless School Inkwells are available in two styles designed to fit the majority of holes now in desks —for flush-type or protruding-type installations. Easy to install with or without guards. Easy to clean. No corrosion, deterioration, or crumbling.

Equip your desks with Sengbusch Noiseless School Inkwells. The worthwhile savings you enjoy back up your good judgment. Write today for descriptive price list.

Sengbusch Self-Closing Inkstand Co.
916 Sengbusch Bldg. Milwaukee 3, Wis.

8-1

For teachers' and office desks . . .

Sengbusch Handi-Pen Desk Sets

Everyone in your school system who writes — superintendents, principals, teachers, clerks—appreciates the effortless performance of Handi-Pen. You just pick it up and it writes. Uniform pen-inking. No flooding. No inky fingers. Less refilling — holds up to a year's supply of ink without evaporation waste. Attractive models from $3.00 to $12.00.

Write for free circular.

The school nurse, guardian of the health of the nation's youth, endorses the quality of Arlington Seating equipment. Correct posture, and all the benefits in future health that it bestows, results, in large part, from the correct early habits that are easily formed in scientifically designed Arlington seats and desks. Here is something that is so important to the American way of life, that the very thought of a compromise with quality is unthinkable.

The construction of superior school seating equipment has been the sole aim of the Arlington Seating Company for more than 40 years. Research into the causes of seating comfort and modern design based on these studies, have given Arlington its outstanding position in this highly specialized field. Expert craftsmen, imbued with the Arlington tradition of excellence, translate correctly designed plans into school equipment that has become standard in many of the nation's finest, most modern schools. Arlington equipment in your school not only assures you the best designed and built seating facilities, but also brings you the greatest economy over the years. Make Arlington desks, tables and chairs the basis for comparison when the time comes to buy new or replacement equipment.

Remember the name—Arlington. Remember, the reason—*school equipment that's a sounder investment.*

Arlington

ARLINGTON HEIGHTS, ILLINOIS

GET SET...NOW!

for early delivery on...

MEDART TELESCOPIC GYM SEATS

your order will put you on our "first-come-first-served" list...no deposit necessary.

Medart's engineering and planning facilities are available to you now...without obligation. By placing your order now, you will insure yourself earliest possible delivery the moment manpower and materials are available. In accordance with Medart's long standing policy of fairness your order will, of course, be cancellable should later conditions void or alter your requirements.

●100% MEDART MADE!

Medart Telescopic gym seats are NOT an assembled product. All parts (metal and lumber) are fabricated, finished, assembled (and tested!) at the Medart Plant. Hundreds of Medart installations all over the country attest the long life and safety of Medart installations.

COMPACT! TAKES UP ONLY 32 INCHES of FLOOR SPACE WHEN "TELESCOPED!"

Easy to open and close due to Medart "floating locomotion." Two types: wall attached or moveable. Write for descriptive catalogue.

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Medart
ST LOUIS MISSOURI

NEW YORK

"The heating system is designed to be so flexible that special purpose rooms for community use after school hours, and for adult education, can be heated without having steam in the entire building."

MICHIGAN

"Certainly humidity, zone controls, and air movement with some method of disinfecting the air circulated will receive the attention due them. The control of these is required if proper comfort and health are to be maintained for the growing bodies subjected to the results of the installation."

ILLINOIS

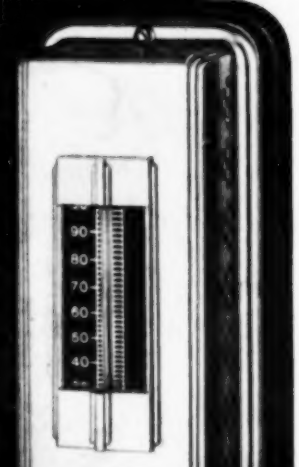
"New designs should include air conditioning systems having compressors for cooling, humidifying and dehumidifying with automatic control."

PENNSYLVANIA

"Most of the present methods for raising room temperatures are still satisfactory if they are designed for economy and are provided with modern control instruments."

EVERYWHERE ENGINEERS STRESS

THE NEED FOR *Automatic* TEMPERATURE CONTROL FOR TOMORROW'S SCHOOLS



PENNSYLVANIA

"Aside from a comfortable room temperature, the most important school need has been to promote a healthful condition in the class room."

MARYLAND

"The term 'heating' should be forgotten and consideration given the more modern approach through 'climate conditioning'."

NEW YORK

"Schools should have a simplified system of temperature control to reduce fuel consumption."

CALIFORNIA

"Schools should have conditioned air to provide heating, cooling, filtration, humidification and ventilation for human comfort."

INDIANA

"Humidifying equipment, probably air washers, should be installed after the heater and should be controlled automatically."

JOHNSON
PIONEERS IN CONTROL

INDIANA

"All heating units, coal, gas or oil, should be equipped with a not too complicated combustion control."

FUTURE PLANNING IS BASED ON PROVED EFFICIENCY OF TODAY

Engineers across the country advocate the use of the finer equipment offered by the builders of Automatic Control systems for the temperature and air conditioning problems of the schools that will be constructed as soon as war-time restrictions have been lifted.

The many schools now enjoying the comfort and economical heating budgets made possible through the Johnson Automatic Control systems have set a standard upon which is based the future planning. The quotations above, from an article in *Heating and Ventilating* magazine for June 1945, indicate that engineers are keenly interested in automatic control and its many possibilities.

Whatever the problem may be in temperature and air conditioning control, Johnson engineers have had many years experience in cooperating to solve the most complicated. Johnson engineers design, manufacture, install and service their own automatic control systems . . . the sure way to build the whole system with the same correct precision as every part.

JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

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